FOOD AND CLIMATE,

CONSIDERED IN REFERENCE TO EACH OTHER.

AN ATTEMPT TO SOLVE THE PROBLEM OF THE NATURAL AND PROPER FOOD OF MAN.

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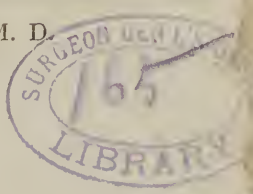

PLURES CRAPULA QUAM GLADIUS.

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CHAPTER I.

INTRODUCTORY.

Notwithstanding so much has been said and written about the natural food of man, and as to which of the kingdoms of nature he should draw his supplies from—the animal or vegetable—or from both, the subject is still very far from being settled. Opinions the most conflicting are entertained upon it by different individuals, each magisterially claiming exclusive accuracy for his own; one set maintaining that man is entirely herbivorous in his nature, another that he is at all times, and under all circumstances, adapted to a carnivorous diet, and a third that he is essentially omnivorous.

In the following pages I shall assume the task of showing that man is not under all circumstances adapted to the same kind of food; but that he may with propriety, under certain conditions, take it from either of the classes; and that criteria to guide him in his selection are furnished by temperature and climate.

Medical men do not in general turn their attention sufficiently to this part of the subject of dietetics; whilst they investigate the remedial agency of aliment—its adaptation to the control or removal of morbid action—they commonly neglect the study of the proper diet for a state of health; on this latter topic our attention has been demanded by various visionary speculators and enthusiasts, who have entertained us with Utopian descriptions of the physical and moral regeneration that is to follow the adoption of their particular plans; the poets too have declaimed tunefully upon this theme; we need not wonder, therefore, at the conflict of opinions. Our knowledge upon this subject, as on most others, is to be advanced principally by the observation and study of facts; to be sure, we cannot in this way take such splendid flights as we can in the realms of fancy; but whatever progress we do make will be more apt to speed us on the way we ought to go.

In thus presuming to step into the arena of discussion, I am not urged on by the self-confident spirit of the well-trained gladiator; on

the contrary I confess considerable misgiving. I am aware that I shall be guilty of faults, both of omission and commission, and lay myself open to criticism: neither my abilities nor opportunities permit me to treat the subject in a way to do it justice; but its importance, and the general neglect of it, induce me to take it up, and urge the propriety—the necessity—of adapting our food to climate and to season. I do not claim for my views entire originality; I presume, however, that much of what will be here advanced will be found to be new—at least to many of my readers—and, now that novelty is so much sought after, be entitled to a passing glance; and I am willing to undergo the ordeal of criticism for the sake of drawing attention to it; so that if I am wrong, I may be set right; and if right, others may become so too.

It is an old remark that "a great book is a great evil." If this should be considered at all an evil, at least the magnitude of it shall not be complained of; making no pretensions to style, or elegance of composition, I shall content myself with the endeavor to combine brevity with perspicuity as far as I may be able; but, though simplicity has been kept in view, to have avoided technicalities entirely would have occasioned an unnecessary prolixity and degradation of style; I have, therefore, for the convenience of the non-professional reader, added a glossary of such terms as are not in common use, or not to be found in our ordinary dictionaries.

I do not intend to discuss the merits of the different *materia alimentaria*, or enquire into the absolute wholesomeness of the various articles of animal or vegetable food in general use; this has been sufficiently attended to by others, and I have nothing new to offer on this head. It is simply my intention to review a broad, fundamental question; that as to whether, and under what circumstances, man should confine himself to animal or vegetable food, or make use of both; and this I shall do as briefly as possible.

I have paid some attention to the subject experimentally; having observed the effects of different habits of diet on myself and others in the West Indies, and in the northern part of the United States, for many years. For one year I rigidly abstained from eating any kind of animal food, living entirely (except a little salt) upon vegetables and water; and for five years I abstained from eating meat. I found these plans unadapted to our changeable climate, though they did very well in the West Indies. The exposure to the inclemen-

cies of weather incidental to a country practice in Ohio, in the winter season, I found required a more liberal diet; for, by adherence to this abstemious regimen, I not only suffered more from cold, but also impaired the digestive powers so as to bring on severe attacks of *gastrodynia*, *pyrosis*, and *duodenal* dyspepsia; all of which, however, have since disappeared under the influence of more appropriate aliment. My own experience in this matter has aided in convincing me that our diet should be adapted to the climate we inhabit; at the same time allowing other circumstances due weight; that in hot climates we should live materially upon vegetable food; that in cold ones our food should be more of an animal character; and that in the temperate and variable regions it should consist of a preponderance of one or the other kind, in accordance with the weather and the season; in warm weather conforming more to the appropriate food of warm climates, and in cold weather to that of cold climates. A temperature of zero of Fahrenheit I suppose to require an exclusively animal diet, or nearly so; one at or near blood heat I suppose to be incompatible with the salutary use of meat. Milk, cheese, and eggs occupy a position by themselves, and can be used at any time when from labor or exhaustion, concentrated food is needed.

In speaking of temperature, it will of course be understood that I allude to the temperature of the atmosphere respired and lived in, and not that of the external air; for, in heated rooms one may be surrounded with the warmth of the tropics, while the temperature without is freezing. There are, however, other things to be considered, particularly exercise and clothing, as modifying the nature and amount of the requisite food. Labor calls for proportional nourishment, and promotes the toleration to some extent of animal food, where, with sedentary habits, it should be abstained from. Clothing may be to some degree a substitute for food; this, however, will be explained hereafter. These things do not affect the rule that *cæteris paribus*, the greater the cold we are exposed to the more animal food do we require; a temperature of about 90, marking the point of total abstinence from it. Spirituous and fermented liquors, I suppose to have some analogy to animal food in their effects upon the system.

I suppose man to have been originally created an inhabitant of a tropical climate, to which, with a vegetable diet, his organization is expressly fitted; but that subsequent events have scattered his race, developed new propensities, and rendered other habits necessary.

Of the causes in general operation, I look upon nutriment and temperature as the great efficients in modifying the development and health of the animal body, and the want of adaptation in them the prevailing source of disease.

This is, in brief, a general statement of the views to be advocated in the following pages. They refer to a subject, at all times of high importance; and it becomes doubly so when impending morbid influences are to be guarded against. It is universally conceded that the observance of correct rules of diet forms the most effectual means of protection against epidemics. As to what should constitute these rules, there exists, as has been said, considerable difference of opinion; thus much may be safely said, however, without fear of contradiction, the plan that is best adapted to sustain the health in general is also best adapted to sustain it through an epidemic period. The one here offered is that on which the vital powers will undergo the least fluctuation; for it forms a check, or balance, to the ordinary disturbing causes, changes of temperature, counteracting their effects, and at the same time supplying the needful demands of the system in a manner best adapted to it. It is a system, too, that is readily fallen in with; nature herself cries out in its favor, and it is the force of perverse habit alone that stifles those cries. Many people instinctively, and without at all understanding the reason of it, pursue a way of living similar to the one here recommended; abstaining in a great measure from animal food in summer, and partaking more freely of it in winter; but this adaptation is usually neglected; not only in health, but also in the remedial management of disease. How few among our physicians take into consideration the effect of season or of climate in their prescriptions as to diet; but how important the bearing of such a course, may be gathered from the perusal of the following pages.

When we consider the absurd dietetic practices that have been so generally recommended and adopted during the prevalence of epidemic cholera, for its prevention; and which have doubtless conspired with the epidemic influence to extend and aggravate the disease, we cannot fail to be convinced that general information upon this head is much needed. Without particularizing, I will merely remark, that these practices have been mostly opposite to the principles here laid down; and the fatality and spread of the disease have been an apt commentary upon them. The "Ohio Medical and Sur-

gical Journal," for July, 1849, in noticing the appearance of the Cholera in the Penitentiary, &c. at Columbus, uses the following language, "Whatever the strictest cleanliness and abstinence from vegetable diet will do towards warding off the disease from these institutions will be effected. The weather, for the greater part of the time since the appearance of the epidemic, has been excessively hot and sultry; the thermometer, on many days, standing as high as 92° in the shade." Now, what effect had this regimen in warding off the disease in the penitentiary, where, we may presume, it was most rigidly enforced? In about a month from the appearance of the epidemic, out of about 450 convicts a fourth part had died of the disease, and nearly all had suffered under it, more or less; thus affording strong evidence that the regimen adopted as a preventive in reality encouraged the disease; for we can scarcely find an instance of such universality of incursion of the disease among a body of people unconstrained as to diet, even under circumstances otherwise most favorable to its spread; and let us bear in mind that the disease was comparatively inactive in the immediate vicinity of the penitentiary, and in the town and country round. Whilst upon this subject I will remark that, as far as my experience in epidemic cholera extends, the disease is more dependent upon the abstinence from fruit and vegetables during warm weather, and the consequent excéssive consumption of animal food, or that of a greasy character, than upon the use of the former. During the epidemic of 1832, I was practising in Brooklyn, N. Y. and being a physician to the dispensary there, met with a good deal of the disease. I can recollect many instances confirmatory of the above remark. I lived then entirely upon fruits and vegetables, using no animal matter in any shape, flesh, milk, butter, cheese, nor eggs, &c.; but, though continually where the disease was prevailing most, I did not experience the slightest symptom of it; and during the summer now preceding, (1849) the disease prevailing over the west and northern portions of Ohio, and cholera morbus, diarrhœa, and dysentery of a fatal character, around the place of my abode, (Somerset) my family consisting of eight, five of them children, and all subsisting mostly upon vegetable food, have been exempt from bowel complaints, and indeed all other diseases. I am inclined to think that in nearly all bowel complaints, the predisposing irritability of the mucous surfaces is first developed by an excessively stimulating and carbonaceous diet; and the train being

thus laid, any irritating substance, even the most wholesome nutriment, may serve to ignite it. This may account for these diseases being attributed, occasionally, to all the customary articles of food. In the irregular actions of the animal economy, people are too apt to imagine every *post hoc* to be a *propter hoc*—in other words, they think that every unusual symptom depends upon the use of some article of food or medicine that has immediately preceded it; whereas, in truth, such symptom may have been altogether independent of such cause.

Upon the proper kind of food the appetite becomes a sufficient criterion of its indulgence as to quantity; and there is no need of having recourse to weight and measure, as with the habits usually pursued is sometimes recommended.

When the climate is uniform, or nearly so, the natives, "to the manner born," most commonly adopt instinctively the kind of food that is most suitable; but in the variable regions this is not the case; in these, habits of stimulation, begot by the influence of cold weather, are sometimes, nay mostly, with difficulty laid aside in warm; for these habits cling to us with a two fold force; first as habits, and besides as means of pleasurable excitement: therefore, a set of rules, founded on a knowledge and understanding of the matter, become in these climates necessary for our guidance.

Most of our treatises on diet are mere apologies for the artificial and perverse habits that prevail. Few (none that I have seen) advocate the due adaptation of our food to the temperature, or a regimen strictly in accordance with our organization and necessities. I do not promise here to supply that desideratum fully; but if I shall be able to any extent to point out the proper course, and induce others more capable to explore it and make it more fully known, I shall not write in vain.

In a country so extensive, and with seasons so very variable as ours, a knowledge of the art of suiting our habits of life, especially our diet, to the varying temperature, becomes of proportionably more importance than in less fluctuating climates; indeed, it is almost the only means within our reach of preventing our health from becoming like the weather, changeable. To those engaged in the navigation of the Mississippi and its tributaries—streams extending continuously for upwards of three thousand miles, through nearly twenty degrees of latitude, and consequently through a great variety of climates, an

acquaintance with the doctrines here inculcated is of much consequence; and an observance of these rules indispensable to the preservation of health; with habits at all right in other respects, they would, I have no doubt, secure the traveller in the enjoyment of his health throughout all the regions in which these streams meander. Not alone, however, to travellers in these regions, but to all who change their climate, or inhabit one that is changeable, the observance of some such rules as these is necessary.

It is not intended that every nice variation of temperature should be noted, and the diet changed to suit it, such minute accuracy is not essential; but that those changes that decidedly produce an impression on the system require an adaptation of diet; mere change of clothing is not enough; more of those complaints called colds proceed from ill adapted food than ill adapted clothing; changes in the weather people commonly suit their habitations and apparel to, but other adaptation is neglected.

Nature always aids us in our well regulated efforts to conform to her demands; she is an *alma mater*, (a tender mother) and with a gentle admonition intimates the first violation of her rules. Slight derangements of digestion, taste, appetite, and spirits warn us of our first excesses; these, if neglected, are succeeded by more serious sickness; it is only to the transgressor that her ways are hard. By the study of, and confirmation to, her laws, most of what are called "the ills of life" may be avoided. In referring diseases to improper habits, I do not include the effects of specific contagion; though even these may be much mitigated, and disarmed of their fatal shafts by proper habits of life, particularly in respect to diet. Ninety-nine hundredths of our ailments, however, proceed manifestly from our own errors.

The following chapters are not by any means intended as essays under their respective heads; they are composed merely of a few remarks that appeared illustrative of the subject, and are thus arranged solely for convenience.

CHAPTER II.

ALIMENT. DIGESTION AND ITS APPARATUS. DIVERSITY OF MAN'S CONDITION, AND NECESSITY OF DIVERSITY OF FOOD, &c.

It is hardly necesssary to inform the reader that the animal body is continually undergoing a disintegration, the old parts being carried away, and their places supplied by new matter, under the operation of appropriate vital forces; and that those beings that have not attained their full growth require an increment of matter proportioned to their expansion; this supply for the wear and tear, and growth of the body is effected from the aliment, and is called nutrition; a due balance being preserved between the waste and the supply essentially constitutes the state of health; the disturbance of this balance, disease.

Besides nutrition, alimentation has another important end to subserve, the generation of animal heat; this will be treated of hereafter.

The want of a suitable supply for these purposes is expressed by the sensations of hunger and thirst. A number of hypotheses have been advanced to account for the sensation of hunger; it has been attributed to the irritation of the folds of the collapsed stomach rubbing against each other; to the irritation of the gastric juce acting upon the coats of the empty organ; to sensations of weakness and inanity from its emptiness; and feelings of fulness from determination of blood to it. Other causes, chemical, mechanical, and vital, have been assigned, equally unsatisfactory. It is probably purely a vital action, and the following theory, in the absence of a better, may serve to satisfy us on the subject. The corporeal body may be compared to a state, or body politic, in which all the subordinate parts communicate by means of an electric telegraph with the capital; transmitting to that place their wants and feelings, and receiving thence their orders and rules of conduct. In the corporeal body, the nerves perform the part of this electric telegraph; they communicate sensations and perceptions to the brain, and take back from it the volitions and impulses that govern the bodily motions. In hunger, I suppose that part of the body requiring to be resupplied thus communicates its wants to the brain, which then transmits its

orders, by means of the *pneumo-gastric* "line," to its commissary, the stomach; this in its turn calls for a supply; the foragers, the hands and feet, go forth to seek it, and the senses act as inspectors, under their particular orders from head-quarters, to see that all is right and wholesome. If all these organs be in a healthy state their functions are performed harmoniously; but it is easy to see how, if one be wrong, the rest may be thrown out; if the nerves be wrong, they may communicate erroneous feelings; if the brain be wrong, it may transmit erroneous orders; if the stomach, it may make a wrong demand; if the limbs be unable to execute their movements, the supply may not be obtained; and if some of the senses be deranged, they may sanction the admission of materials detrimental to the whole system; or if any of these parts be very much disordered, it may not be able to perform its office at all. The sensations, perceptions, and in fact all the vital operations, being much under the control of habit, other rules for our guidance, besides those furnished by the sensations themselves, become necessary; these rules must be founded on experience and observation. We may see from this, how necessary it is that our habits should be correct in all particulars: for, if, by erroneous ones, we derange any one function, that one may disturb all the rest. The causes of thirst are analogous, and its effects similarly manifested. This view enables us to have a slight idea how the need of a supply is felt, and how the particular kind of aliment required is pointed out; it gives us an instance of the wonderful adaptation of means to ends that prevails in nature, and of that consent called sympathy, that obtains in all vital operations.

But, in our artificial state of life, these natural sensations are not, of themselves, sufficient for our guidance. Doubtless much digestive and constitutional derangement may be, and is occasioned by the use of food, not in itself unwholesome, but unadapted to the particular condition of the system. Thus, when unstimulating and cooling fruits and vegetables are called for, the substitution of the reverse (i. e. flesh and fat) may excite the evils of *plethora* and *pyrexia*. When very efficient nutrition is demanded, impotent and bulky food may occasion deranged and painful performance of the digestive functions, as well as the consequences of inanition. To contribute some assistance to the intimations of appetite in these particulars, and make reason its handmaid, is a material object of the present disquisition.

It would not comport with the limits assigned to this little essay to enter fully into the doctrines of digestion and nutrition, or to describe the properties of the different alimentary articles; I shall presume my readers to be somewhat acquainted with these things, and refer to them no more than may be deemed necessary to illustrate the subject of the adaptation of food to climate and season. For this purpose it will be sufficient if we consider food under its two leading classes, animal and vegetable.

Alimentary substances, whether animal or vegetable, are divided into the azotized and non-azotized. Of the former are albumen, or the principle of white of eggs; fibrine, or the principle of flesh; caseine, that of cheese; and gelatine, of animal jelly, glue, &c. Of the latter are reckoned fat, starch, sugar, gums, vegetable jelly, and vinous fluids. These, though not absolutely elementary substances, are called the elements of nutrition and of respiration; for, they constitute the organic particles by which, with some modification, the system is nourished and warmed, and the animal economy is able to go no farther than these in the selection and appropriation of matters to its sustenance. Plants, on the other hand, are able to appropriate the absolute elements. Albumen, fibrine, and caseine, are elements of nutrition; for they consist of matter that can be appropriated to the animal fabric generally; gelatine is supposed to be capable of nourishing the gelatinous tissue only; the remainder of the materials above enumerated are considered elements of respiration; for not consisting of matter analogous to the substance of the body, it is asserted that they can be applied to no other purpose in it than that of respiration; this, however, will be more fully considered in the succeeding chapter.

Albumen, fibrine, and caseine are identical in their absolute elements, they are, therefore, called isomeric,* and can be used indifferently in the nourishment of the body. Their organic portion, alike in all of them, is called proteine,† because it holds the first rank as a nutrient. It is the substance that nearly all the animal tissues are composed of, and is contained in all nutritious substances, whether animal or vegetable.

With regard to their uses and effects as nutriment, the most material differences between vegetable and animal food depends up-

* Ισος, equal and μερος a part.

† πρωτευω, to hold the first place.

on the former containing a large amount of insoluble matters, which become excrementitious; it is, therefore, less applicable where very efficient alimentation is needed; besides, the elements of both are held together by different, and in the latter frequently weaker, chemical affinities; they, therefore, require modifications of digestive function and apparatus to suit their particular use. The digestive organs of a carnivorous animal are not adapted to contain and act upon sufficient bulk of vegetable food; nor is the gastric juice of the one kind of animal adapted to restrain the affinities or dissolve the food of the other.

Flesh and fat constitute, as will be explained hereafter, the most stimulating and heat-engendering food; they are, therefore, best adapted to sustain the system under a low temperature. Caseine and albumen are adapted to the repair of the exhausted tissues at all times; and may be preferably used, instead of flesh, when from violent exercise or otherwise, in warm weather, very efficient nutriment is needed; the superiority of these things to flesh as nutrients in warm weather, is probably owing to their being less prone to decomposition.

It is the office of digestion to dissolve the elements of nutrition and respiration, and put them into a fit condition to be absorbed by the lacteals; the extremities of which are scattered throughout the inner surface of the intestines, and drink up from the dissolved food the materials of the blood, by means of the circulation of which the body is nourished and warmed. The portions of food that are of no further use become excrementitious; and materials that may have been absorbed, but which are not needed in the system, are eliminated by various secreting organs, as the kidneys, liver, cutaneous pores, mucous membranes, and intestinal glands; these parts, if too much imposed upon by the ingestion of superfluous matters, are apt to become diseased.

The areolar tissue has the power of saving, in the form of fat, the surplus hydrogen and carbon, which may serve to answer future demands for animal heat. Other materials cannot accumulate much beyond the present wants of the system without unpleasant consequences. A body, like a market is best kept in a healthy state by adapting the supply to the demand.

With all animals, probably, in the independent state of their existence, some kind of digestion is necessary to nutrition; at least with

the higher orders nothing but the immediate results of that process can be appropriated in that way; these should proceed from those articles that their organs are adapted to act upon, and be suited to the wants of the system, or we cannot expect a healthy assimilation to take place; to suppose the contrary would be as unreasonable as to expect to "gather grapes from thorns, or figs from thistles."

Some form of organic matter is necessary to the sustenance of all animals; to some animal matter, to some vegetable matter, and to some both, according to the constitution of their organs. The anatomical conformation of the digestive apparatus furnishes us with an indication of the kind of aliment its possessor is adapted to; its extent and complexity are in the ratio of the bulk of the food to be acted upon, the indigestibility of it, and the amount of unnutritious matter it contains. The carnivorous animals of warm climates have a comparatively small and simple digestive apparatus; those of cold climates a more extensive one; and herbivorous animals, generally, the most extensive and complex of all.

That climate as well as food requires and has an adaptation of digestive organs to it, where the nature of the food cannot be modified, has hitherto, I believe, been overlooked. That the carnivorous tribes and even some others, of cold climates, possess more capacious digestive organs than those of warm ones, will, I am persuaded, be confirmed by more extended observation.

The feline races of hot climates have, in general, the intestines about three times their bodily length; the canine genus and domestic cat of temperate regions have it extended to about five times; these latter cannot modify the nature of their food, or adopt a more stimulating diet, to suit their colder climate, but nature thus enables them to act upon a larger quantity. The white or polar bear has intestines ten times its length, and lives on flesh entirely; whilst the brown bear, an omnivorous animal of a milder climate, has intestines only eight times its length. The same thing is found among some herbivorous animals; thus the African elephant has an intestinal length of about seven times, and the Asiatic elephant ten times that of its body. The latter yields more readily to the varying circumstances of domestication, and is able to endure greater vicissitudes of climate. These things show that there must be a modification of digestive organs, or of food, or both, to suit diversity of climates; a larger amount of heat-engendering food being necessary in cold

climates to keep up the bodily warmth; this will be spoken of, however, more fully when we come to treat of animal heat.

The stomachs of sheep, cattle, deer, camels, and some others of the purely herbivorous animals, that extend their races into almost all the regions of the world, are not only very capacious, but are also complicated, there being as many as four distinct digestive compartments in some of these. In carnivorous animals the stomach is always simple.

In the camel, deer, sheep, ox, and horse, the length of intestine is from twelve to twenty-four times that of their respective bodies. In them, and all herbivorous animals, the cœcum and colon are large, and drawn up into saculi or cells by longitudinal bands.

Not only are the intestines usually shorter in the carnivorous classes, but their calibre is less, and they have fewer folds of the mucous membrane within; their cœca and colons are not drawn up by longitudinal bands into cells, as in herbivorous animals and man; their stomachs, also, are much less capacious; in fact every thing conspires to occasion a diminution of the interior or absorbing surface.

In man, the stomach is of a medium capacity, and the intestines are from six to eight times the length of his body; from the extent of his digestive organs it is evident that he is not adapted to feed on very concentrated aliment, unless there are large demands for animal heat; and his cellubar cœcum and colon point him out as adapted to the use of vegetable aliment, without which he is never so well nourished as with it.

The cœcum has been called another stomach; it in fact performs the office of one; for, while flesh is always dissolved in the stomach in healthy digestion, and reduced to the pultaceous mass called chyme, a considerable amount of vegetable aliment passes out of it undigested; this is submitted to another digestive process in the cœcum, and the nutriment is absorbed there, and in the saculi, or cells of the colon. Dupuytren informs us that in wounds of the human intestines, he observed that alimentary matters escaped from the wounds low down the course of the bowels in proportion to the indigestibility of the food, and that animal matters did not appear at all.

The machinery of mastication is also in different animals adapted to their particular kind of food. In the carnivorous tribes the teeth are pointed, or wedge shaped; the lower ones close within the upper

and act like scissors; the canine teeth, or fangs, are very long and conical, and the lateral motion of the jaws is slight; the shape of their jaws and the muscles that move them are also adapted to their predatory habits. In the herbivoræ the contrary prevails; their teeth are mostly flat on the surface, of an equal length, and opposed against each other in the upper and lower jaws; the lateral motion of their jaws is considerable; in short, the arrangement is evidently for the purpose of bruising and grinding the refractory substances that constitute their food, so that the solvent powers of the gastric juice may be brought to bear upon them.

In man the teeth are of an equal length; there are but two pointed ones in each jaw, with four incisors, and ten grinders; and there is considerable lateral motion of the jaws. The stomach more nearly resembles that of the carnivoræ than the herbivoræ; but in the cœcum and colon there is a nearer approximation to the latter.

It has generally been concluded that man, in his form and structure, is placed midway between carnivorous and herbivorous animals, and that consequently he is essentially, and at all times adapted to an omnivorous diet; this inference is evidently drawn more from a limited observation of his prevailing habits, than from physiology, or comparative anatomy. Man's digestive organs resemble those of a class of animals that are purely frugiverous in their native state. The conformation of the orang-outang (Simia Satyrus) and the larger species of the ape tribe in general, bears a close general analogy to that of man; and with regard to those parts that act upon their food they are nearly identical in structure. In the number, situation, and shape of the teeth, and in the formation and articulation of their jaws, they are alike, except that the canine teeth are longer and more pointed in the apé, and the muzzle is more projecting; its intestines, too, are on an average somewhat shorter proportionally; these facts would indicate that man should be, in warm climates, the less carnivorous of the two; but it is a well known fact, that when in a state of nature, and left to the guidance of their natural instincts, the ape tribe is frugiverous, confining themselves exclusively to vegetable food when it can be procured; though when it cannot, they are capable of subsisting temporarily upon an animal diet. The native climates of these animals are the hottest regions of the earth; where in their natural state, they are probably invariably healthy; but when

removed thence to colder regions, or deprived of their appropriate food, they languish, sicken, and soon die; under these circumstances they are particularly subject to tubercular consumption.

The lights of comparative anatomy, and the consideration of man's internal structure, are clearly in favor of the opinion of his adaptation to a vegetable diet; though his digestive organs and general habit of body are so constituted as to admit of the use of animal food when circumstances require it. The absence of all predatory advantages of tooth and claw proclaim him to to be naturally badly adapted to wage war upon his fellow denizens of nature; and his naked skin pronounces him originally an offspring of the tropics, or warmer regions of the globe. In these regions we have the strongest authority to bear out the inference that man and the Simiæ are intended by nature for the same kind of food; but beyond this the analogy must cease; for, whilst the ape tribe is confined to the tropics, and even there within very narrow limits, the superior flexibility of constitution, and vastly greater intellectual endowments that man possesses, enable him to conform to all varieties of climate and season; to turn all the conditions of the universe to his advantage, and provide for his wants in whatever part of the world his lot may be cast.

Let us for a moment turn our attention to the extremely various circumstances under which the human race subsists.

The Greenlanders and Esquimaux live between the 70th and 80th parallels of north latitude, in regions of almost perpetual frost, where scarcely any kind of nutritious fruit or vegetable can be obtained.

English, Russian, and Dutch sailors have, at different times, wintered at Spitzbergen, Nova Zembla, and Melville Island, where mercury and spirits froze to solid masses, even in the rooms where they had fires.

Our Indians are able to endure an intense degree of cold with but very little aid from clothing. Lewis and Clarke inform us in their "Travels," that two Indians slept on the snow, in ordinary light dresses, when the thermometer at sunrise was at forty degrees below zero; the one, a man, sustained no inconvenience; the other, a boy, had his feet frozen, but they were restored by washing in cold water.

It is notorious that sailors, and others, suffer less mortality and sickness in cold climates than in the tropics. This indicates that their habits are better suited to the former regions than the latter.

Man's nature, however, is better suited to the latter; the sickness he suffers there is mainly owing to his neglect of the proper adaptation of his diet, which is conformed to in the other instance.

Denham and Clapperton observed the thermometer to stand at 130° in their tent, on the banks of lake Tchad; and it commonly ascends to above 90° in the shade, and 140° in the sun throughout the greater part of Africa. When the Sirocco blows in Sicily, it rises to 112°. Dr. Chalmers observed a heat of 115° in South Carolina, in the shade; and Humboldt, in the Llanos, or deserts near the Orinoco, a temperature varying from 110° to 115°.

Under all these circumstances, and others infinitely various, man is able to subsist in health and comfort. Overcoming adverse circumstances by means of his arts and inventions, he establishes himself the monarch of all the realms on earth. He may in truth exclaim—

"Creation's heir, the world, the world is mine!"

There is no other animated being that can sustain itself under such diversity of surrounding influences, or endure them without degenerating into wider varieties than those of man.

Was this aptitude, this flexibility of constitution, conferred on man without an object, or to "rust unused"? or was it the design of the Creator that those regions, incapable of producing fruits for his subsistence, should be unoccupied by man? If not, we must conclude that a vegetable diet is not, at all times, necessary, or even proper for his subsistence. Even if vegetables could be procured in frigid climates, the demand for materials of calorification is there so great, that the extent and power of his digestive organs are not sufficient to contain and act upon vegetable food enough to furnish those materials.

Experience teaches us that the constant use of animal food alone is the most wholesome, as well as necessary diet to the Esquimaux, the Samoiedes, the inhabitants of Terra del Fuego and other high latitudes. We find that the Russians, who winter on Nova Zembla, are obliged to imitate the Samoiedes, by drinking fresh rein-deer's blood, and eating raw flesh, in order to preserve their health.* Dr. Aikin, in a "Memoir on the attempts to winter in high northern latitudes," informs us that these practices were found most conducive to health in those climates.

* Lawrence's Lectures on Physiology, &c.

Dr. Richardson, on being asked how he, accustomed to the bread and vegetables of the temperate regions, was able to endure the pure animal diet that formed his only support in his expedition to the Polar sea, along with Captain Franklin, replied that the effect of the extreme dry cold to which he and his companions were constantly exposed, living as they did in the open air, was to produce a desire for the most stimulating food they could obtain; that bread in such a climate was not only not desired, but comparatively impotent as an article of diet; that pure animal food, and the fatter the better, was the only sustenance that maintained the tone of the corporeal system; but that, when it was abundant, (and the quantity required was much greater than in the milder latitudes,) a delightful vigor of mind and body were enjoyed, that rendered life highly agreeable.*

We need not, therefore, be surprised to find man, in these cold climates, living and enjoying health, upon what to us appears the most disgusting food. The Greenlanders, and other dwellers within or near the Arctic Circle, enjoy the raw flesh and blubber of the whale; they eat the half frozen or half putrid flesh of the seal with as great a relish as the enlightened American or European does his greatest dainties; they drink the blood of the seal while warm, and esteem dried fish moistened with whale oil a luxury. Bread and fruits are disliked by these people, and spit out with disgust; and I have heard that, when farinaceous food, and other articles of the diet of civilized life, were introduced by some missionaries among a tribe of Esquimaux, they became a source of sickness to them.

The dwellers in these cold countries are not so well nourished by their exclusive animal diet, as the inhabitants of milder regions are upon their vegetable or mixed food; but on any other kind of food they would not be able to exist at all.

The principal reason for the use of these articles of diet in cold climates exists in the necessity that obtains there of using food abounding in soluble carbon and hydrogen, or what Liebig calls the elements of respiration. This is the source of animal heat, which will form the subject of the ensuing chapter.

* Combe on the Constitution of Man.

CHAPTER III.

ANIMAL HEAT. ANIMAL FOOD THE GREAT EXCITER OF IT.

As on the topic of Digestion. I shall treat but briefly on that of respiration; saying no more upon it than I shall deem necessary to illustrate my subject.

That the heat of the body is excited by the combination of the oxygen of the atmosphere with the carbon and hydrogen of the blood, is now generally conceded. The theories in explanation of this subject, first advanced, I believe, by Drs. Black and Crawford, have been amplified and confirmed by Liebig.

The fact that oxygen disappears, and carbonic acid and aqueous vapor are given out, in respiration, is easily demonstrable. It is well known, too, that oxygen cannot combine with carbon to form carbonic acid, without the production of heat. Whether the combination be very rapid, as in a fire, or very slow, as in ordinary decay, the amount of heat evolved is the same; though it may be distributed through unequal times.

It is immaterial to the purposes of this essay, whether we consider, with Crawford, that the combination takes place in the lungs, or whether we suppose, with Liebig, the red globules of the blood to be the carriers of the oxygen which combines with the carbon in the course of the circulation; the consequent carbonic acid being given out by the lungs. The latter supposition, however, is probably the correct one.

The temperature of the human body is nearly the same in all climates; if there be any difference, it is ordinarily higher in cold climates. The healthy standard is about 98° of Fahrenheit; but it is evident that the amount of heat given off must be greater in cold weather than in warm. With an atmosphere at zero, the loss must be immense; while, within the tropics, where the air is nearly of the temperature of the body, the loss will be comparatively trifling. This loss of caloric must be immediately replaced; for the temperature of the blood being reduced a few degrees is injurious, and even fatal.

This re-supply of the heat of the body lost by evaporation, radiation and conduction, is effected by the combination of the oxygen of the atmosphere with the carbon and hydrogen originally supplied by

the food, in the same way that the heat of a fire is occasioned by the combination of the oxygen with the carbon and hydrogen of the fuel. The food thus becomes ultimately the fuel to supply the animal machine with heat; and the greater the demand for heat, the more the appetite increases, and the keener is the demand for aliment abounding in carbon and hydrogen, or heat-engendering elements.

Under certain circumstances, the (absence of a large demand of food for calorification, and the use of no more than the necessary amount of food for nutriment,) all of the food may, previous to its final application to the formation of heat, be applied to the nutrition of the body; and the removed and worn-out parts of this alone be used for purposes of heat. Still the materials of bodily warmth are ultimately derived from the food. Under other and opposite circumstances, a large proportion of the means of bodily warmth may be drawn directly from the food.

An Esquimaux could not endure his climate for a single day upon the diet of the Hindoo; nor could the Hindoo digest a single meal like that of an Esquimaux. Any attempt even to approximate in diet, between these two, would occasion the one to freeze to death, and the other to perish of a fever, or diseased liver.

Food, as we have seen, furnishes the elements of nutrition, or those particles that can be appropriated to the fabric of the body; and the elements of respiration, or those particles that cannot be applied that way, but which, consisting partly of soluble carbon and hydrogen, may be made to furnish heat by means of respiration.

Except fats, the articles called elements of respiration are not those that are able to contribute most to animal heat; for they contain much less carbon and hydrogen than most animal matters do. Animal food is a more powerful exciter of systemic heat than starch, sugar, or gum; though these latter are supposed by Liebig to be merely subservient to the purposes of respiration in warming the body; but it is certain that, in man, they are comparatively inefficient in that way. Indeed, I am inclined to think that sugar must perform some other offices in the economy than simply those of respiration. In warm climates and weather, when there is the least demand for means of heat, there is the greatest craving for sweets. All persons conversant with the sugar plantations, are aware of the fact that the Negroes upon them become healthy and fat during crop time, who were otherwise previously. They are then allowed to use sugar

freely, which gives a healthy tone to the digestive organs; and, with the children, it proves an excellent vermifuge. Most persons who have been much confined to animal food, in warm climates, have, in consequence, experienced a desire for saccharine substances. This, if not gratified, is apt to be followed by disease.

Many of our best and most observant physicians have noticed the good effects of sugar in the preservation of health. Sir John Pringle asserts that the plague does not visit regions where sugar constitutes a material part of the diet of the inhabitants. Cullen, Rush, Fothergill, and many other eminent physicians, think that malignant fevers are lessened in their virulence by the use of sugar. Well known maritime facts prove it to be a most valuable antiscorbutic. In China and India it is a main article of diet for the inhabitants. In* Cochin China, the king's body-guards are obliged to eat, every day, a certain quantity of sugar, in order to preserve their *embonpoint* and good looks. It is quite a mistake to suppose that sugar injures the teeth. No persons have whiter or better teeth than the Negroes on the sugar plantations; and it is equally erroneous to suppose that it occasions worms in children; these more frequently arise from excess in the use of greasy and animal food. Saccharine food appears to act as an antidote to the injurious effects of the excessive use of animal matter; and this result probably depends upon its antiseptic properties, which it is well known to possess in an eminent degree; restraining decomposition, and an excessive affinity for oxygen, in those parts of the system obnoxious to such influences. (This will be better understood after reading the appended chapter on malaria, &c.) Its free use I consider very salutary in warm weather; and if generally adopted, it would, I have no doubt, go far to prevent many of the epidemics of those times.

The indomitable perseverance with which children pursue and possess themselves of sweetmeats, in defiance of interdictions, threats, and even lock and key, is a forcible expression of their need in the economy of the system. Fortunately the calls of nature are not easily silenced; in spite of tyranny, ignorance and bigotry, she will makes her pleadings heard and effectual.

Nature produces the greatest abundance of saccharine fruits and vegetables in the warmest climates, which, to a believer in final causes, would be an argument of their being serviceable to man and

* New Monthly Magazine, March, 1831.

animals otherwise than by engendering heat. Be this as it may, it is certain that flesh and fatty matters are the most efficient means of engendering animal heat; more especially the latter, which, consisting almost wholly of carbon and hydrogen, is capable of combining with a large amount of oxygen, and consequently of furnishing a large amount of heat.

Fat meats contain from sixty to eighty per cent. of carbon, and from six to ten of hydrogen. Starch, sugar, and the gums, contain nearly as much oxygen as they do of hydrogen and carbon; and the fruits so much used by the natives of the warmer regions contain, in their recent state, not more than twelve per cent. of carbon, and a very immaterial amount of hydrogen, except that combined with oxygen, and forming water, which, with the excess of oxygen that they owe their acidity to, tends to the reduction of the bodily warmth.

Chemistry thus reveals to us why fat and flesh should excite more heat in the system than any form of vegetable food except the vegetable fats; but we must not neglect the vital laws that may conduce to this effect. Animal food is more stimulating to the vital forces, as well as capable of giving out more heat. Stimulation, though of itself it cannot create heat, may, by quickening the vital motions, act like an increased draught to a furnace, or stirring up a fire; and, by enabling the oxygen to come more rapidly in contact with the carbonaceous matters, thus favor their more rapid combination.

As in a furnace, by the laws of matter, so in the animal machine, by the laws of life, the heating process, once commenced, produces results that favor its continuance and increase as long as heat-engendering matter enough remains. Carbonated blood is the appropriate stimulus of the right side of the heart, which, when in health, like every other organ, acts in proportion to the application of its proper irritant; an increased action in this, the pulmonary heart, calls forth a correspondingly increased performance of the pulmonary function, respiration. By this means oxygenated and decarbonated blood, the proper stimulus of the left side of the heart, is transmitted there with increased force; this side—the systemic heart—in its turn acts with increased energy, and propels the blood more rapidly around the body. In this way is increase of heat developed, and heat itself is a general stimulus that quickens all the vital motions. Thus, by the intervention of the nervous system, the different forces are made to act in accordance with the amount of work to be performed, at least

to some extent. The only limits imposed to this increase of heat and action, are the natural limits of the functions of innervation, digestion and of respiration. These are, however, not at all times restrained to the mere wants of the system; they sometimes overact, and may then produce disease and death. The only effectual safeguard is to administer to the system, in all things, simply in accordance with its wants.

The functions of the liver are connected with the phenomena of animal heat; for whether, with Liebig, we suppose the carbon and hydrogen of its secretion, the bile, to be usually absorbed, combined with oxygen, and made to give out heat, which is perhaps the more probable theory; or with older physiologists, we consider it to become excrementitious, after assisting in chylification, we must in either view allow its influence, though in different ways, upon the caloric of the system. The bile is a saponaceous compound, containing a large amount of fatty matters; it is combustible, and of course capable of yielding heat largely by combining with oxygen. The liver, it is seen, then, separates heat making elements from the blood; they may usually be absorbed again, and burnt in the system; but there can be no doubt that when the liver acts inordinately, and secretes an unusual amount of bile, that fluid may become excrementitious, and pass off by the bowels. This state of things is apt to take place in hot climates, and weather, when people indulge much in animal, or greasy food, and vinous drinks; and thus the bile carries off with it the superfluous elements of heat; but if this increased action of the liver and bowels, or some substitute for it, do not take place, the undue quantity of carbon and hydrogen in the system are laid hold of by the oxygen, and an evolution of heat beyond the requirements of health is the result. The continued influence of the same causes produces many of the various diseases of the liver, and fevers of hot climates; and we can thus perceive how increasing the secreting action of of the liver and bowels may aid in resolving these diseases. Heat and a carbonaceous diet are the means pursued to enlarge the livers of geese as Strasbourg, to make the celebrated *pates de foie gras*. In hot weather, upon a too highly stimulating diet, diseases of the liver, and in cold weather, diseases of the lungs, are produced; in each instance by the particular organs being overtasked.

The old and effete parts of the body that are absorbed, and thus reintroduced into the circulation, are incapable of further purposes

of nutrition; the impulse of decomposition has been given to them, and the vital forces are insufficient to atone for the feeble chemical affinities of their elements; or in other words to overpower the stronger affinities between them and oxygen; their carbon and hydrogen therefore subserve the purposes of respiration, and their nitrogen is principally eliminated by the kidneys.

The product of this metamorphosis of the tissues, as it is called, is sufficient, probably, in warm climates to sustain the bodily warmth of man; but in cold climates something more must be made use of. It is easy to understand how the dissolved animal matter of our food, may very much resemble in its condition in the system, and the uses it is there applied to, the absorbed or metamorphosed tissues of the body; they are both derived from animal matter that is in a condition adapted to incipient decomposition, if it be not already in that state; and are consequently very ready to be laid hold of by the oxygen. Because its elements are more disposed to combine with oxygen, is one reason, probably, why flesh, partly decomposed is relished or preferred by men and animals who use it as a means of enabling them to withstand a low temperature; another reason is, it is more readily digested; and the stomach is able to dispose of a larger quantity of it; on both accounts it is better adapted to engender heat than meat that is very fresh.

Those people who feed exclusively on animal matters, as the Burats, Samoiedes &c., are badly nourished, light and feeble in body, though well warmed by their food. Those on the contrary, who feed exclusively, or almost so, on vegetable products, as the Hindoos, some Africans, and the natives of many other warm climates, are sufficiently well nourished, though not much heated by their diet. From these facts we may infer that vegetable aliment is better adapted to nourish the body, and animal food to warm it.

That, in the human subject, the pabulum furnished to the blood by animal matter has its elements held together by weaker affinities than that furnished by vegetable matter, and is consequently more ready to combine with oxygen, is evinced by the fact that those who indulge largely in the use of meat, especially in warm weather, almost invaribly have the smell of putrefaction in their breath; this would seem to indicate that materials furnished to the economy from the digestion of flesh, are less fitted to hold their place in it as nutrients than those supplied by vegetable matter. Hence we may see

the impropriety of allowing animal food, even in the smallest quantities, in fevers; and not only as it may furnish increased heat and disturbance by its own decomposition, but also as it may become a source of more active decomposition in other particles of the blood, upon the principle, that bodies, themselves prone to combine with oxygen, may confer a similar disposition on other bodies with which they may be in contact, as of ferments; this will be more fully explained in the appendix, concerning miasms &c.

Man is the most highly organized, impressible, vascular, and plethoric of all beings, more especially in his brain and dermal system; which latter is, naturally unprotected and highly sensitive. For his size, he has perhaps the most active circulation according to the usual ratio of increased size occasioning diminished frequency of pulse. For instance the heart of the elephant contracts a very few times in a minute; that of a horse or an ox about 30 times; that of a sheep about 64 times; that of a dog nearly 78; and a man about 72 times; the ordinary standard of health being taken. In man there is also probably, the most rapid disengagement of caloric, and disintegration of the tissues; he therefore stands in need of a large supply of the elements of nutrition and respiration; and in cold climates, of the arts for his protection. Some animals possess a higher bodily temperature, as birds and the fur animals; but this is most likely much owing to the retention of the heat by their non-conducting coverings.

Thus then is food necessary to supply the growth, the waste, and the warmth of the body; and the greater the functional exercise of any organ, the more rapid is its waste; for it is a law of nature that there shall be no manifestation of power or force of any kind, without a decomposition of substance. Even the phenomena of mind are produced at the expense of the substance of the brain: how, or why it is so, is not at present understood; and perhaps in this state of existence never will be; increased exercise of any kind, therefore as well as increased cold, calls for a corresponding increase of food.

Previous to birth there can be but little necessity for the evolution of heat in the fœtal system; therefore there is but little oxygenation of the blood, or transformation of the tissues. The kidneys and liver are almost quiescent, neither secreting urine or bile in any considerable quantity; the condition of the circulation may account for this; carbonated blood passing through the renal arteries, and depurated through the portal system; the former possessing no ex-

cess of nitrogen for the formation of urea, and the latter but little of carbon and hydrogen for that of bile; both conditions contrary to the state of after life, and unadapted to the functions of those organs.—The fœtal blood can be but little oxygenated, for but a small portion of it passes through the hypogastric arteries to the placenta, in its circulation; and that of the parent can do no more than share its oxygen with it, and take away a moiety of its carbon. On respiration taking place, a different state of things is established; oxygen reaches the lungs and begins to prey upon the carbon and hydrogen of the blood, and heat is evolved; the tissues begin to waste more rapidly, the liver to pour out bile, and the kidneys urine; food is therefore required, or in other words the elements of respiration and nutrition, to meet these demands.

Enough has been said to show the connexion in the animal system between temperature and food.

CHAPTER IV.

OF WARM AND TEMPERATE CLIMATES. MAN'S DIET THERE AND ITS EFFECTS &c.

Having, previous to the preceding reflections on animal heat, made a few remarks upon cold climates, and man's appropriate diet in them, let us now turn our attention for a few moments to his dietetic habits, and condition in warm and temperate climates.

The food and appetites of the natives of hot climates, are, as we might expect, in perfect contrast with those that prevail among the inhabitants of cold ones. This is not, as some maintain, because flocks and herds cannot be so easily raised there; for in many, nay most of the warm climates, the facilities for raising cattle are very great. The absence of winter dispenses with the necessity of providing hay, grain, or shelter for them; the constant warmth maintains a constant growth of herbage, and is in general so well adapted to their nature, that they are enabled to subsist and increase with little or no attention from their owners. Different appetites, and the dictates of experience furnish us with more valid reasons for the different practices pursued in these different regions.

Warm climates are commonly considered by the inhabitats of colder ones as necessarily sickly; but it would be very easy to prove, that with appropriate habits, they are in general as healthy, as the

colder ones; or even more so; the causes of sickness in them are, as in other places, mostly dependent upon violations of the laws of our being; in other words, upon improper habits.

It will, I suppose, be very generally confirmed by observation, that warm climates, with their appropriate habits, are the healthiest.—The Hindoos, Pacific Islanders, some of the South American Indians, Caffres, and even the Negroes in what is usually considered the sickliest part of the world, the western coast of Africa, are among the healthiest, best formed, and most active people in the world: they also furnish, perhaps, the most striking instances of longevity.

The Hindoos, whose climate is so exceedingly unfriendly to people from northern regions who carry with them their carnivorous practices, that few of them retain their health there many years, are themselves described as being remarkably exempt from disease. Abstinence from animal food constitutes a leading feature in their customs; it is enjoined by their religion as well as by their climate; and to its observance is their immunity from disease to be ascribed. This abstinence is found to be consistent with the most enduring muscular exertions; for though the flesh eating European there finds the conveyance of his own person from place to place to require an inconvenient effort; and (by such slender means is his health disturbed,) he is as afraid of night air and atmospheric changes as of poison, a set of Hindoo palanquin bearers, whose chief diet is a little rice, will convey him upon their shoulders in a palanquin for miles, beneath a burning sun, over hills, and through streams; and at night will sleep upon the bare ground, and in the open air, enjoying uninterrupted health. They, poor fellows! from their sensations would scarcely know they have a liver; but their master is most feelingly convinced of the existence of his; for from the heat, and excessive use of carbonaceous food, it becomes enlarged and painful; still is he wedded to his northern habits, and appears incapable of learning, either by experience or example.

"The natives of Sierra Leone, whose climate is said to be the worst on earth, are very temperate; they subsist entirely on small quantities of boiled rice, with occasional supplies of fruit, and drink only cold water; in consequence they are strong and healthy; and live as long as men in the most propitious climates."*

The laborers on the coast of Africa who go from tribe to tribe to

* Monthly Magazine.

perform the manual labor, and whose strength is said to be wonderful, are said to live wholly upon rice and other vegetable products; and Denham and Claperton assert that the eboe negroes, who live entirely upon vegetable food, are the most athletic, finely formed, and healthy men they had ever seen. How comes it then that the exploration of the countries inhabited by these people has occasioned the death of nearly all the white travellers who have undertaken it? Is it from a radical difference between the constitutions of the races? I think not; for we find that the African race, when living under the same circumstances as the European, is subject to precisely the same diseases; it is principally because the travellers have continued to use a flesh diet when exposed to a temperature, at all times nearly equal to, and sometimes even above that of their bodies; and this, as has been said, is entirely incompatible with the salutary use of meat. From ignorance of the necessity of adapting food to climate, they have attempted to live in these warm regions as they had been accustomed to do at home; perhaps using stimulating liquors, intentionally to mitigate, but in reality to aggravate the effects of climate; and in consequence they were destroyed by what are called the "malignant fevers and fluxes of those sickly countries."

Humbolt describes the Indians of Peru, Mexico, Quito, and New Granada as a peaceful set of cultivators, remarkably exempt from diseases, and accustomed to uniform nourishment almost entirely of a vegetable character, that of their maize and cereal gramina.* "They are hardly subject to any deformity. I never saw a hunch-backed Indian; and it is extremely rare to see any who squint, or who are lame in the arm or leg. In the countries where the inhabitants suffer from goitre, this affection of the thyroid gland is never observed among the Indians, and very seldom among the Mestizoes," (the offspring of of a white parent and an Indian.) In his personal narrative he repeats the same testimony very strongly concerning various other South American tribes.

How then did it happen, that during the late war with Mexico, our men suffered far more from febrile affections and bowel complaints than from the enemy? That these were not the results of climate merely, is sufficiently proved by the exemption of the natives from them; they must have proceeded from something wherein our men differed from the natives; and this was undoubtedly their dietetic

* Political essay on the kingdom of New Spain Vol. 1 p. 152.

habits; their food consisting largely of meat, and their drink of ardent spirits; both, to the extent that they were used, counterindicated by the climate, and inevitable causes of those diseases there.

The inhabitants of the islands of the Pacific ocean were, when first discovered, but little subject to disease. Their forms were symmetrical, their features commonly agreeable, and their manners mild and pleasing. We are told in Cook's Voyages that the English sailors stood no chance with them in boxing or wrestling; and the same has been remarked by others. From their contracted territories, density of population, and the absence of domestic animals, the use of flesh was, to a great extent, precluded, even had they been inclined to it. Yams, plantains, bread-fruit, and the cocoa-nut; and with those who inhabited the coasts, the occasional addition of fish, constituted their customary diet. Of fish diet in general it may be remarked that it is not so stimulating and heating as flesh, and, in this respect, may be said to stand midway between flesh and vegetable food.

It were easy to multiply instances to prove that the diet of natives of hot climates is generally of a vegetable character, and that it is necessary to health that it be so; but the foregoing are sufficient. I will remark, however, that I am not aware of an instance of the inhabitants in general of a hot climate pursuing very carnivorous habits, and possessing healthy characteristics. We may indeed meet with occasional instances of individuals whose peculiar habits of life and constitution favor the toleration of a larger use of animal food than would be right or safe for others. Of these habits active exercise has the greatest effect that way; for it occasions a more rapid removal of the muscular fabric, and consequently a greater demand for similar matter for a re-supply. This has been alluded to before. Exercise has also the effect of giving tone and vigor to the nervous system; rendering it more robust, less irritable, and consequently less susceptible to the effects of those external and internal agents that would be apt to derange the functions of systems more delicately nerved.

The developement of a part is increased, or altogether excited by its exercise; indolence and debility must, therefore, go together. It cannot be said, however, that hard labor, or great muscular exertion is necessary to the enjoyment of the most perfect health; on the contrary, it may become injurious. All that is needful is that the different functions should be moderately exercised, and that the food should be adapted to the real wants of the various organs. Though much

exercise may serve to promote the tolerance of stimulating food, and, under the combined influence of both, we may witness a favorable state of health, we must not thence infer that the same, or a superior degree of vigor, health and longevity are unattainable upon a simpler diet.

Observation among our Indian tribes may convince us that a diet at all times largely constituted of animal matters, in our climate, favours neither health nor longevity; for they are very subject to suffer from febrile epidemics and contagions. Whole tribes are sometimes swept off by small-pox, measles, &c. In this way the Mandans, a western tribe, have lately been exterminated, and other of their neighboring tribes much thinned. A singular instance is recorded in the Philosophical Transactions, Vol. 54, for the year 1764, of a very fatal inflammatory fever, which appeared on the islands of Nantucket and Martha's Vineyard, on the coast of Massachusetts, and was confined entirely to the Indian population. Not a single white person having been affected on either island. The whole number of Indians on Nantucket was 340. Of these, 258 had the distemper in the course of six months, and only 56 recovered. Of those who did not take the disease, 40 lived in English families and eight dwelt separate. In Martha's Vineyard, it went through every Indian family into which it came, not one escaping. Of 52 persons affected 39 died. A few individuals of mixed breed (European and Indian,) and one of Indian and Negro, had the distemper, but recovered. None, indeed, died, but such as were entirely of Indian blood: hence it was called the Indian sickness.* The only rational way of accounting for this exclusive preference of the disease to those of Indian blood, is by supposing that it depended upon their peculiar way of living. A greater addiction to the use of animal food is at all times a sufficient reason for a greater liability to inflammatory complaints; and doubtless it had its influence in occasioning the disease in question.

The Hottentots and New Hollanders possess a soil and climate well adapted to the human race; yet these varieties are few and sparse in numbers, apt to be ill formed, stunted, sickly, and short lived. Buffon states that the Hottentots seldom attain a greater age than forty; and Barrow, that they pay no attention to the cultivation

* Lawrence's Lectures on Physiology, &c.

of the soil, living mostly on animal food, and are in their persons ill formed and diminutive. Collins* describes the New Hollanders, and natives of Van Dieman's land, as the most miserable savages; without morality, religion, or ideas of right or wrong; without chiefs, arts, arms or agriculture; deriving no other sustenance from the earth than fern-roots and a few orchises; and living on what chance affords —fish, frogs, lizards, serpents, the larva of insects, and whatever other animal matter they can obtain. Inhabiting warm climates, these people fail to supply themselves with a sufficiency of vegetable aliment; subsisting principally upon what is adapted neither to their nature nor circumstances. A continuance of the same influences must result in their further degeneration and ultimate extinction.

In the East and West Indies the European residents commonly pursue even a more heat engendering and stimulating diet than they were accustomed to in their native places. They partake more largely of animal food, instead of less, and their flagging appetites are goaded by curry and other stimulating sauces; they drink wine and spirituous liquors in larger quantities; and in all things regarding their diet too commonly pursue the rule of wrong. This proceeds from prejudice and habit, and the extended means of their indulgence; for in the north this stimulating course is much—too much even for those climates—practised and esteemed; happy is he thought, whose means enable him to follow it. We listen more to habit than to reason; and habits of stimulation, as I have before remarked, are laid aside with difficulty; thus it is with those who change a cold for a warm climate; they have been accustomed to regard the use of stimulating meats and drinks as a mere source of gratification; and with increased facilities for procuring them, they will indulge more largely, rather than reduce their use to suit climate and other circumstances; hence increased vital action, and fevers of a rapid and fatal character are the results.

Upon the principles here endeavored to be explained, it is not very difficult to see how warm climates must of necessity be sickly to those who pursue the practices adapted to colder ones. Pathologists need not look for gasses and atmospheric impregnations to account for the evil; the fault lies in the perverse habits of the individuals, though they do not like to confess it. We are naturally inclined to excuse

* Acct. of English Colony in New South Wales.

ourselves; and have even gone so far as to "make guilty of our disasters the sun, the moon and the stars; as if we were drunkards by an enforced obedience to planetary influence; and all that we are evil in, by a divine thrusting on."*

The dietetic habits of the French are better adapted to warm climates than those of the English, Irish, Scotch, or North Americans. They are habitually more abstemious, and consequently endure the effects of the change of climate better.

The diet of the white Creoles in general, and the negroes in the W. Indies, is much more in conformity with the requisitions of the climate than that of the Europeans and N. Americans. Yams, plantains, cocoas maize, ochroes, and other vegetables and fruits constitute the bulk of their food; and they seldom have much relish for stimulating drinks. With these habits they are remarkably healthy; their skin is mostly cool and comfortable; they are never known to take the yellow fever, and seldom any other kind; and instances of remarkable longevity are by no means rare among them. Those, however, among the wealthier Creoles, who for fashion sake conform to English dietetic usages, are about as prone to sickness as those whose habits and examples they strive to imitate.

It is an old saying that those who cross the sea change their climates but not their inclinations. ("Cœlum non animum mutant qui trans mare currunt.") As far as dietitic habits are concerned it should be otherwise however; in this respect the sooner the one change is adapted to the other, the better it will be. Change of diet and change of clothing constitute all that is necessary to enable the system to accommodate itself to the new influences; no change of constitution is necessary, though the contrary is commonly said and supposed; were this the fact, in our climate we should need to be as perpetually changing our constitutions, as our garments.

Some people adopt and advocate the plan of continuing to wear flannel, and warm clothing during summer and in warm climates; this keeps up a perpetual drain of perspiration, and at the same time guards against changes of temperature; and thus may to some extent counteract the effects of repletion and over stimulation. It is, however, an oppressive plan, and one that is entirely unnecessary and improper in connexion with a correct system as to diet.

*Shakspeare.

It is in the temperate regions that man appears the most decidedly of an omnivorous character; and from attention to his usages in these regions, persons have concluded that he is by nature constituted at all times and under all circumstances to be so; a conclusion drawn from a too narrow observation of facts. Animal food can here be abundantly and easily procured, and is to a certain extent necessary; most fruits and vegetables can here also be obtained; and experience teaches us that both kinds of aliment are capable of being, in these regions, advantageously applied to the use of man. In the northern parts we find the meats and fish to be mostly of a better quality, more palatable and wholesome than in the south. In warm waters poisonous fish are not uncommon; and some kinds become so in them, that do not possess that quality in cold ones. Those accustomed to pass up and down the Mississippi remark that the meat and fish obtained below the mouth of the Ohio river, are in general inferior to those obtained above.

Admitting man to be omnivorous in the temperate regions, it is not therefore to be inferred that the indiscriminate use of both kinds of food at all times and seasons, as is the common practice, is correct and adapted to the wants of the system. It is, indeed, usually supposed to be so, but this I shall endeavor to show is an error.

We find that many portions of what are called the temperate zones possess, at different seasons, great extremes of heat and cold; and few have this character more than our own country; let us for a moment turn our attention to the nature and constitution of our climate. The temperature of a country does not depend on latitude alone; it is much under the influence of its prevailing winds, which owe their temperature to the surfaces over which they pass. Our states are situated towards the eastern side of a large continent; and the prevailing winds, as in all latitudes beyond the thirtieth parallel are from the westward. These in winter traverse snow-covered mountains, frozen lakes, streams, and plains, and bring with them all the coldness they acquire in passing over these surfaces; when they incline from the north they retain their arctic coldness, and carry it very far into southern latitudes, occasionally depressing the thermometer to zero even as far as the thirty-fifth degree. In summer, the winds reaching us from vast extents of shadeless plains, heated by the sun, become also heated to some extent like the sirocco and simoom of Italy and Arabia; so that as far north as the 45th parallel

it is no uncommon thing for the thermometer to stand at 90 in the shade. In the same latitudes in winter, it sometimes sinks as low as thirty or forty below zero; though a change of wind may, on a sudden, bring on all the mildness of spring. Over the northern parts of the United States the thermometer has an annual range of over 100 degrees. The same state of things obtains in China. It is, perhaps, somewhat of a misnomer to call climates characterized by these extremes temperate. On the western sides of both the old and new worlds, in corresponding latitudes, the climates are more equable. There the prevailing winds, coming directly from the Atlantic and Pacific oceans, become, like these oceans, of a milder and more uniform temperature. Countries thus situated may properly be called temperate; such are California and Oregon, towards the sea-board; as well as England, France, Spain, &c.

Now, if the adaptation of food to climate have any thing to do with the preservation of health, it is obvious that countries having seasons of great extremes of temperature—the coldness of Lapland, and the warmth of Africa—require in the inhabitants appropriate modifications of dietetic habits; Lapland weather requiring to some extent a Lapland diet; and African weather the food of Africa. But the exclusive animal diet of some northern tribes cannot be needed here, as the comforts and conveniences of civilization protect us largely against extremes of weather; and our cold spells being generally of short duration, we should hold ourselves in readiness for the sudden raise of temperature we may expect to ensue upon them; these sudden changes of weather, surprising the system, as it were, in a condition not adapted to them, occasion the unpleasant effects commonly called "colds." Our diet should, therefore, be arranged upon a kind of a compromise; both to suit the state of things we have, and what we may expect; precise adaptation, in regions subject to very sudden changes, not being practicable. The same may be said of our warm weather; an exclusively vegetable diet seldom, perhaps, being necessary; the rule being to adapt the general character of our diet to the average temperature of a given period; the closer this is observed, the more uninterrupted will be the health. Thus in Ohio, the principal adaptation called for is to subsist mostly upon vegetable food during the warmer months, and partake more largely of animal food during the colder. Of the latter, however, we generally take enough, and from the influence of habit, in summer we are apt to

take too much. Previous to the setting in of spring, when the effects of the returning sun are beginning to be felt, it becomes of importance to check the carnivorous propensities contracted during winter; for this it would be wise to institute a period of abstinence about that time; the occasional abstinence from meat, too, serves to curb our appetites for it, and prevent their acquiring an undue ascendancy. The observances to this effect followed by a portion of our fellow citizens, and kept in Catholic countries generally, become valuable as sanatory regulations.

It is a common error, and even inculcated by medical writers,* that exposure to a warmer temperature occasions an expansion of the fluids of the body. The blood retains the same temperature in summer as in winter; but the less demand for animal heat, in the former, may occasion an accumulation of the matters that supply it, in the system, unless the habits are modified to suit the weather.

We must expect a very variable climate to be a sickly one, unless some plan similar to the one here laid down be followed; it is to the neglect of this that the reputed sickliness of our country is to be ascribed; with proper habits I have no doubt the United States would be as healthy as any other portion of the world.

It may perhaps be objected that the free use of fruits and vegetables is apt to occasion bowel complaints in the summer and fall, especially with children. "*Cave autumnos fructus*," (Avoid autumnal fruits,) has become a proverb; but I am satisfied it is a very fallacious one. The sickliness of summer and fall is not owing so much to the use of fruits, as to other causes, of which a very operative one is an excess of animal food. In warm climates, with the natives, who indulge largely in the use of fruits, bowel complaints are of rare occurrence; and in our own country, I have always observed that on farms and in country locations, where children range the fields and orchards, and use fruits as freely as their appetites call for them, which we all know as very craving that way, they are but little affected with diarrhœa, and *cholera infantum* is almost unknown; but in our cities, where they are much restricted in the use of fruit, from over caution or necessity, these complaints in hot weather become a deadly scourge. In all climates that will produce esculent fruits and vegetables, man's organization and nature are

* As in Jackson on remittent fever—Dickson on heat, &c.

adapted to their use; and we might as well suppose an herbivorous animal liable to be made sick by wholesome grass, as man by the temperate use of "the kindly fruits of the earth." Excess of animal food may so deprave and debilitate the digestive organs, that they may for a time lose the faculty of digesting vegetable matters, which require more energetic solvent powers; but correct habits will generally restore their proper functions. Because the stomach becomes depraved, is a very foolish reason for persisting in the use of a depraving cause. Even cattle, after being kept over winter on dry food, will sometimes kill themselves on pasture, if suddenly turned into an abundant growth of it; but will any one deny, on this account, that herbage is their most natural and wholesome food? it proves, however, that great changes in dietetic habits should never be adopted suddenly: *Non subito muta assueta, nam consuetudo altera natura est*, (Change not suddenly your habits, for use is second nature,) is an aphorism of Hippocrates, and a valuable one. Still, depraving usages must be corrected, but with an eye to reason; and the changing seasons call for appropriate changes in our food; but as summer does not suddenly succeed to winter, so should we not change at once from a merely, or even mostly, animal diet, to an entirely vegetable one.

There is perhaps a degree of incompatibility in the free use of fat and animal food, and that of the acid fruits and vegetables, that may give to their combination a degree of deleteriousness, in some respects, that neither may have separately; if so, it would go to show that each class of esculents has its appropriate province, as is here contended for, and that they should not be made to interfere with each other, to an undue extent. This is enlarged upon somewhat in the appended chapter on cholera.

In very variable climates, the art of adapting our habits to the changing seasons requires all the aids of reason and experience for its acquisition, and to overcome the force of habit; accordingly in those countries where this adaptation is most needed, we find man to be endowed with the highest mental attributes; the necessity of this adaptation is perhaps a final cause of this endowment—one reason that Infinite Wisdom has ordained it so.

CHAPTER V.

OF THE NATURAL STATE AND FOOD OF MAN.

There has been much speculation and difference of opinion among writers, concerning man's state of nature; which state we are told he ought to conform to in his diet; some contending for the propriety of his uniform use of one kind of food, some another. In opposition to these theories, I contend that he is now the creature of circumstances, whatever he may have been in former times.

If by a state of nature we mean the happy, innocent, and healthful state that man is supposed to have existed in before the institution of arbitrary social regulations, we may search in vain for such a state in actual existence; the only such a one he ever lived in must have been his primeval one; that, probably, described by the ancients as the golden age; and by our sacred writ as paradise.

Even if such a state could any where now be found, it would hardly furnish appropriate rules for man's observance every where; neither do the accounts we have of such a former state give rules adapted to his present lot. The world is now given to him for his abode, and reason for his guide; consequently his condition and habits must be much modified by circumstances. Custom, convenience, and necessity govern him; thus in Lears' phrase; he becomes "sophisticated;" his "forked animal," "unaccommodated man," can, as a class, have no existence. Whatever accords with our organization may be said to be natural; whatever disagrees with it, unnatural; this is the chief criterion we now have of what is right or wrong, natural or unnatural.

Animals have a cogent instinct given for their guidance, which when uncontrolled is adequate to that purpose, and generally undeviating; this leads them in their one path, their state of nature, which they are incapable of transcending. Arriving early at maturity, they make no progress with the lapse of ages; communities of bees, or beavers are in the same condition now that they were in five thousand years ago. Instinct impels every being to conform to the habits of its kind; the full fledged nestling would spread its pinions, and launch itself upon the air, even if it had never seen its parent

fly; the duckling hastens to the pond, and trusts its bosom to the liquid element, heedless of the solicitous calls of its foster mother, the hen; Galen's new born kid, when placed in a room where there were three vessels filled with honey, wine, and milk, respectively, smelt the two former and passed on; but coming to the third, it drank. What this feeling is, we cannot define otherwise than as "the Divinity that stirs within" all living things; one of those indications of which the world is full pointing to an intelligence as the controlling Power. It arises independent of volition; and arrives at its greatest perfection coetaneously with the development of the bodily faculties. It is not necessary that man should have this faculty now to the extent that animals possess it; he has the attribute of reason given for his guide; this results from the voluntary study of the facts and circumstances connected with a given subject; and is the presumption of truth drawn from their comparison; it requires cultivation, and time for its development; and it may improve indefinitely, and advance from age to age towards perfection; man is therefore a social, reasoning, and progressive being; and it is impossible to define the limits of his advancement, or predict to what extent his faculties may ultimately reach; for they strengthen with their exercise, and increased powers in the parent entail increased capacity in the offspring.

Man then is not limited to any one condition that can be called his state of nature. In the infancy of his race, and anterior to the development of his present faculties, it seems necessary that he should have lived in such a state; and we have evidence accordingly that he did so, which we will refer to presently; this state has long since ceased; the period of the direct guidance of the Deity through the operations of instinct, with man has terminated; new faculties have been unfolded, necessary to his adaptation to the varying conditions of the world; to their guidance he is now resigned. The uniform guidance of instinct would not seem to comport with the designs of the Creator, which appear to be now calculated for the indefinite progress of the human race.

In saying that man is guided by reason, and animals are by instinct, I do not mean to assert that man is absolutely independent of instinct, or that animals are entirely without reason; but merely that in man reason is the predominant faculty, and in animals instinct, though neither of them are wholly under the guidance of either fac-

ulty; man has the remains of one, and animals the dawning of the other.

We do many things from habit, necessity, the force of example, or erroneous judgment, that are in violation of our instinctive feelings; and by a continual tyranny over them they may become extinct. How many pernicious habits are there from these causes? our tastes thus become perverted, our appetites depraved and our feelings, moral and physical, deranged. The use of hot and heating food, intoxicating drinks, and tobacco, excesses in animal food and other things; the undue indulgence of our appetites and passions in various ways; yielding to the erroneous dictates of fashion; wearing superfluous, tight and inconvenient apparel; among a host of other things, may be enumerated as proceeding from this cause; all militating against our true happiness and enjoyment. To counteract and cure the evil we must have resourse to reason; in the indulgence of our appetites we should consider the ends for which they were ordained; and only yield to their demands as far as may be conducive to those ends; "we should eat to live, not live to eat;" and in all our indulgences hold in view the duty we owe to ourselves and others.

Were we to attend to the instincts of our nature, we could hardly say that a flesh diet is always conformable to them; though its use from necessity at some times, induces us to take it from habit at others, when not needed. The smell and taste of raw flesh is generally nauseous; and it is only by condiments and cookery that it becomes palatable; art then triumphs over nature, and it may be necessary at times that it should do so; we should be careful however not to become too artificial, and thus completely silence "the still small voice" of nature that pleads within; by so doing we add to the original "fall," and sink ourselves still deeper in degradation.

The flesh of horses, dogs, cats, rats, snakes, and of many other things eaten in various parts of the world, and perhaps as nutritious, palatable, and wholesome as most other kinds of flesh, is looked upon with disgust in the United States, and Europe; and nothing short of dire necessity could in these places enforce its usé for food. The people of temperate and warm regions view with supreme disgust the practices of the Esquimaux in feeding on raw, half putrid flesh blubber, and entrails of whales and seals; this kind of aliment however, we have seen is necessary in their frozen country; and to them it appears as natural as our choicest fare to us. *Necesitas non habet le-*

gem. (Necessity has no law.) Necessity compels the adoption of these things, and habit reconciles them, however disgusting they may at first appear. *Vis consuetudinis vim naturæ obtinet.* (The force of habit has the power of nature.)

On the other hand any new kind of fruit or vegetable excites no such repugnance, unless nauseous to the smell or taste. These things seem to indicate that the early instincts of our nature are not entirely lost, although we have acquired the guidance of other faculties.

Horror at the sight of blood is a feeling common to herbivorous animals and man, and sometimes in the latter very difficult to overcome. On this account unusual strength of nerve is required in a surgeon; and I have known many persons deterred from entering the profession by inability to overcome this feeling.

The sight of a dead carcass of any kind excites emotions quite contrary to appetite. Were we by nature, and instinctively, carnivorous and sanguinary, (for the two must go together,) it would be paradoxical to suppose that the sight of blood, or of a carcass, could be associated with the unpleasant emotions we find them to be; on the contrary, they would be connected only with agreeable feelings.

The conflict that obtains between the moral and physical wants and dictates of our nature, and our habits and necessities, tend to confirm the doctrine of our lapse from an original condition.

I contend, then, that a warm climate and a vegetable diet are most in conformity with man's original nature, and that his instincts that way are not entirely lost; but that his organization admits the use of a diet of flesh under certain circumstances, as a matter of necessity; that the principal end of using that kind of food is to engender heat, or rather to combine a high degree of calorification with nutrition, and enable him to inhabit the colder regions of the earth, and the rule should be to limit its use to the accomplishment of that intent.

But it may be said, if man were first created for a warm climate and a vegetable diet, and the human race were at first confined to them, we ought to have some evidence, traditional or otherwise, to that effect. We have such evidence: the most ancient records and traditions clearly point that way.

Of the traditional accounts, the most ancient are probably some of those connected with the Grecian mythology. They probably have reference to events occurring, some of them, anterior to the Mosaic

deluge; and are supposed to be remnants of the Samian idolatry, a religious system older than that of Moses. The framers of the myth sought to envelope its doctrines in an intricate garb of allegory and fable, which, it becomes a task of considerable ingenuity to unfold and explain. One of the most ancient of these allegories is that of Prometheus. It is related somewhat variously, but the following are its most material points. Prometheus, son of Iapetus, sacrificed the first ox, and offering the bones to Jupiter, retained the flesh. The god, in revenge for this indignity, deprived mankind of fire, which, however, Prometheus managed to steal from heaven. In punishment for this offence he was chained to Mount Caucasus, where an eagle preyed upon his liver, which grew by night as much as it was consumed by day. After a great length of time, (30,000 years according to some,) Hercules slew the eagle and released the captive. This allegory has given rise to much speculation; it is considered to have reference to that alteration in the human condition commonly called the fall of man. The following is probably a fair explanation of it. Before the time of Prometheus [that is, forethought, wisdom, &c.,] we are told that, under the direct reign of Saturn, the sire of gods,* the golden age prevailed; and men subsisted in health, innocence, and happiness, upon the spontaneous products of the earth; perpetual summer reigned, and property, the arts, and inequality were unneeded and unknown. This happy state, however, did not last; the silver age succeeded, in which the different portions of the earth were allotted out to individuals to hold as special property; and Iapetus, (that is Japhet,) having colonized the colder regions of the north-western part of the old world—Europe—his descendants found it necessary to have recourse to fire and the arts dependent thereon; among others the culinary and the use of flesh for food. Prometheus (the inventive genius of the European race) taught mankind these things, and they became a prey to cares, anxiety and disease, (typified by the eagle.) Hercules, (that is labor and improvement,) in the course of time, removed these evils. Prometheus being chained to Mount Caucasus, (which is situated near the confines of Europe and Asia, north of that part of Asia which our records point to as the cradle of the human race, and between

* Does not this refer to instinct?—

"Nor think in Nature's state they blindly trod;
The state of Nature was the reign of God."—Pope

the colder and warmer regions, where the climate undergoes its greatest change of temperature,) would indicate that the carnivorous habits of the race of Japhet fitted them for the colder regions of the earth, and prohibited them from extending southward beyond that boundary without disease. The consumption of the liver by day and reproduction of it by night would seem to indicate the diseases arising from a stimulating diet in summer, and their disappearance in winter. The slaying of the eagle may refer to the effects of the progress of reason and experience in the removal of our evils. Some writers have gone so far as not only to make this fable have reference to the fall of man, but also to the promise of a redeemer. It has, however, more probably only a temporal signification. It has been much commented upon, both by ancient and modern writers, and considered pregnant with meaning; this will excuse the introduction of it here, and its application to the illustration of the doctrines of this essay.

The mythology was succeeded by the Mosaic system; to which, (as it is not my province to treat of it as a matter of revelation,) I shall allude as to a mere historical or traditionary record. It is by far the most important and explicit one we have of the cosmogony and man's early state. We here find allusions to a state of man similar to that described in the mythology. That much of the narrative is figurative, we are forced to suppose; we should otherwise find ourselves involved in inextricable conflict with the established facts of modern science; this too was the uniform style of the ancient writers of the east. We are informed in it, that man was at first placed in a garden abounding in the usual products of tropical climates,* and with fruits, seeds and vegetables of every variety adapted to his subsistence, which he was told were placed there for his food;† but of the fruit of the tree of knowledge, of good and of evil, he was told not to eat. This command, however, he broke, and thus forfeited the innocence and simplicity of his nature; in punishment, he was expelled the garden, and forced to earn his food by his labor; his

* Genesis Chap. i. verse 9. "And out of the ground made the Lord to grow every tree that is pleasant to the sight and good for food."—Verse 12. "There is found bdellium, &c."

† Gen. Chap i. verse 29. "And God said, Behold I have given you every herb-bearing seed which is upon the face of all the earth, and every tree in which is the fruit of a tree yielding seed; to you it shall be for meat."

food was still confined to vegetable products.* All the ills of life flowed in, in consequence of this act of disobedience. At length men became so depraved, that a deluge was sent for their destruction, except one family, which escaped and settled the various parts of the earth as they are at present peopled. Then were men first allowed to use the flesh of animals for food.† All this is so clearly applicable to my tenets here, that it scarcely needs any further adaptation. At first man was innocent and happy; he was guided by his natural instincts, no changing seasons disturbed him, and the earth spontaneously produced all things necessary or desirable for him; but he became in time less innocent and obedient to the inspirations of his Creator; and more inquisitive and knowing; violating the laws and dictates of his nature; whence shame, sin, sickness, discontent and toil came upon him; these things progressively increased; and at length a vast cataclysm came, destroying most, and scattering the remainder of his race into the remotest regions of the earth; Europe being colonized by Japhet. Mankind then first began to make use of flesh as food.

In confirmation of these accounts of the first condition of the human race, I may remark that during its infancy, and anterior to the unfolding of its intellectual faculties, and the acquisition of the arts so necessary to its existence under present circumstances, it must, from its very nature, have dwelt in some such state as that described.

There are other traditions of ancient nations pointing to the same circumstances; but it is needless to follow the subject further. We have sufficient evidence of an alteration in man's condition; which alteration consisted, in part at least, in his removal from a warm climate, and his departure from the vegetable diet there adapted to his nature, and exclusively followed; this is all we are in search of.

A vegetable diet and warm climate were, then, the primeval lot of man; they are, in connexion, therefore, fitted to his nature; a flesh diet, however, has become necessary, in consequence of the change of this lot; and his intellectual endowments and pliability of constitution furnish him with the ability of accommodating himself to this change of circumstances.

* Gen. Chap. iii. verse 18. "Thorns and thistles shall it bring forth for thee, and thou shalt eat the herbs of the field."

† Gen. Chap. ix. verse 3. "Every moving thing that liveth shall be meat for you; even as the green herbs have I given you all things."

CHAPTER VI.

OF THE VARIETIES OF THE HUMAN RACE; AND WHETHER THEY ARE DEPENDENT ON FOOD AND CLIMATE. THE SAME OF OUR DISEASES.

It is asserted by those who maintain that animal food is at all times improper to man, that his use of it is always a source of disease and degradation; others on the contrary contend that superiority, particularly in strength and courage, is induced by it. I shall endeavor to show that there is no foundation for either supposition.

That animal food is not a peculiar source of strength and courage is made sufficiently evident by those who feed exclusively upon it, as the inhabitants of high latitudes in general. The Esquimaux, Laplanders, Samoiedes, Ostiaes, Tungooses, Burats, the natives of Kamschatka, and of Terra del Fuego, who subsist almost wholly upon it, are perhaps the smallest, weakest, and most cowardly people in the world. The evidence of Pallas concerning the Burats, a Siberian tribe, strikingly disproves the fancied connection between the use of animal food and the possession of strength. "Their appearance," says he, "is generally effeminate, and they are mostly so small in stature, and weak, that five or six Burats are often unable to effect what a single Russian can accomplish. This want of power is not the only circumstance which proves, in the Burats and other Siberian nomadic people, that a mere animal diet is unnatural and incapable of maintaining in perfection the physical prerogatives of our species."

On the other hand it cannot be said that deficiency in strength and courage is necessarily attendant upon a vegetable diet. What has already been said is sufficient to prove, that in the warmer regions of the earth, a vegetable diet is perfectly consistent with, and even necessary to, a full development of bodily form and vigor; and as for mental greatness and courage, we are told that in the periods of their greatest simplicity, manliness and bravery, the Greeks and Romans lived mostly upon plain vegetable preparations; in fact, in conformity with the indications of their climate, and the rules here sought to be explained.

That animal food is altogether improper and unwholesome for man, and the use of it under all circumstances depraving to his physical

and moral nature, as some eloquent writers have maintained, cannot be conceded; for we find that the mixed diet made use of in the temperate regions is accompanied with the best combined condition of mind and body that the world affords. Shakspeare, Milton, and Newton; Washington, Jefferson, and Franklin; and a host of other brilliant names, attest that the mind, in these climates, undergoes no deterioration from the use of a mixed diet; while the conquests and dominant position of our variety of the human race, for the last two or three thousand years, attest at once its superiority in war and policy.

Warm climates, when accompanied with their appropriate habits, appear to be the best adapted to our physical development, and the variable regions to our mental; in the frigid climates man is stunted alike in mind and body. The varying seasons and their accompanying demands urge to mental activity; the sameness of the tropics is apt to lead to stagnation of the mind; and extreme cold torpifies the faculties; while an exclusive animal diet is unfavorable to our nature.

But it has been said that we should not ascribe the superiority or inferiority of different tribes to their food or climate, but to the breed, or variety of the race. Upon what, then, does the variety of the race depend? This question has been much agitated. Some, as Lawrence,* denying the operation of external causes, argue that they originated in mere variations from the natural standard, and are propagated by the union of parents possessing the requisite peculiarity of conformation. In Lawrence's language, "The variety does not depend upon specific difference, but upon variation." This is a mere evasion of the question; upon what causes does this variation depend? To assert that it has no cause, or that it is independent of extrinsic causation, is to appropriate the Epicurean doctrines to physiology, and contend for the "fortuitous concourse of atoms" in the growth of man and animals. The mind refuses to rest satisfied with this kind of reasoning, and seeks for something more definite to repose upon.

I contend that variation in man and animals depends upon the circumstances under which they are placed, especially with regard to food and climate; and they become superior or inferior in proportion as these comport with their nature and organization. That we can-

* Lectures on Physiology, &c.

not trace the operation of these causes step by step, and demonstrate them by experiment, is no proof that they have no existence; for the laws of vitality elude our deepest search; the influences under which men live are infinitely various, and the length of time they may have operated is incalculable; our views as to their effects must therefore be mostly beyond the reach of demonstration, and depend much upon theory.

True we do not see the offspring of negro parents becoming white in Europe; nor that of European parents black in Africa; but many other circumstances besides climate may have conspired to occasion these extremes of variation; and they may have been in operation for an enormous length of time, of which we can form no idea. We know, however, from actual observation that warm climates favor the production of dark hues in the skin, hair, and iris; for we seldom see the offspring of fair skinned and light eyed and haired parents in hot climates, possessing those peculiarities to the same extent as their immediate parents even; and the descendants of the English, Irish, and Scotch in the East and West Indies are mostly characterized by dark hair, eyes, and complexion, which we know are not marks of their ancestry. To what extent the change might pass in the course of time, we cannot say.

As nature knows no intermission in her operations, and all her phenomena are linked by the catenation of causation with something that has preceded them extrinsically, (for they cannot cause themselves) it is a fair inference that variations in a race of beings depend upon exterior causes; which must be the peculiar circumstances in which the race is placed. On reaching a certain point, the variation becomes transmissible by the law of generation that like produces like.

By the proneness of living being beings to run into varieties, we mean their faculty of adaptation to circumstances; and the terms are convertible; for a faculty of adaptation infers a disposition to run into varieties; they are natural consequences of, or rather they mutually imply each other. Superiority in a living being is occasioned by a better adaptation of external influences to its nature; and inferiority by those less fitted to it. The operation of external influences then, and an internal principle of adaptation to them, are the occasion of all the varieties of animated beings. In the present state of our knowledge we cannot perhaps, have much more definite ideas upon the subject.

The infinite mutability of external influences occasions an endless diversity in the productions of nature; no two being precisely alike; to counteract the tendency towards degeneration from this cause, it is wisely provided that there shall be an universal strife and rivalship among all organic beings for individual preservation, and the perpetuation of their races, and that the superior shall prevail. Plants vie with each other for possession of the soil and light; and among all animals, the stronger will prevail over the weaker; the same in man; though with him the intellectual will be more apt to achieve a supremacy over the physical, in proportion to the superiority or his general social condition.

To show the effects of insufficient, or unwholesome aliment upon the form and condition of the human body, I will make the following quotation.* "There are parts of Ireland inhabited by a population descended from those who were treated by the English as rebels two centuries since, and who were driven into mountainous tracts, bordering the sea, where they have been exposed to the two great brutalizers of the human race, hunger and ignorance. The present race is distinguished physically from the kindred race of Meath and other neighboring districts, where the same causes have not been in operation, by their low stature, (not exceeding five feet two inches,) their pot bellies, and bow legs; whilst their open projecting mouths, with prominent teeth, and exposed gums, their advancing cheek bones and depressed noses, bear barbarism in their very front. "These spectres of a people that once were well grown, able bodied, and comely, stalk abroad into the daylight of civilization, the animal apparitions of Irish ugliness, and Irish want." The whole aboriginal population of New Holland presents a similar aspect; and apparently from the operation of the same causes.

To illustrate the effects of other causes in producing alterations in an organism, I will refer the reader to the accounts we have of the finny tenants of the streams that run through the dark, extensive caverns of Kentucky and Tennessee; neither vouching for the fact, nor denying the possibility of its truth. The fishes inhabiting these dark abodes are said to be destitute of eyes. If this be true should we account for it by supposing that these gloomy waters have required a distinct effort of Creative Power to furnish them with living

* Carpenter's Elements of Physiology—§ 420—Philadelphia, 1846.

things adapted to them? or that in accordance with the laws of that Power certain organs should gradually disappear when circumstances no longer call for their use?*

This faculty of adaptation is confined within certain limits, beyond which it cannot pass. When a living being is exposed to a state of things very foreign to its nature; or rather that is more adverse to it than its powers of adaptation will enable it to comply with, it must deteriorate, sicken, and eventually die.

We must allow, then, to food and climate prominent places among those causes that tend to produce varieties in man; they are intimately connected with all his habits; his very existence depends upon the one, and much of his comfort upon the other; and if to any thing, we must allow to them the power of affecting his organization. This point granted, we certainly cannot look upon the climate of the temperate regions, and the mixed diet there used, as generally detrimental, or unfavorable to the human race; these causes have produced no degradation there; taking all their attributes together, the natives of the temperate regions stand foremost in the ranks of men.

It must, however, be admitted that on the score of health there is something still lacking. Although there are not in these regions in general, causes in operation sufficiently depraving to occasion a degeneration of the races, still departure from health is so frequent an occurrence as to render it very desirable that its cause and remedy should be made known.

The causation of disease may be considered analogous to that of variety. It consists in the operation of influences unfavorable to the organism, which produce either change of function, or change of form in the part diseased, or both. If the deranging causes be not of suf-

* It is remarkable that the influence on plants and animals, of the medium in which they live, or through which they are sustained, appears to be recognized in the Mosaic account of creation. Thus it is there written "And God said let the *earth bring forth* grass &c," "and it was so." "And the *earth brought forth* grass." "And God said let the *waters bring forth* abundantly the moving creature that hath life, &c." "And God said let the *earth bring forth* the living creature after his own kind, &c." Here we see a remarkable, peculiar, and consistent phraseology running through the whole, doubtless replete with signification. In the succinct style of that venerable record it appears to me that the influence of the medium is distinctly alluded to; we do not see this with regard to things not dependent on the medium in which they are placed. It is not said let the firmament bring forth, &c.

ficient intensity to subvert vitality, they may, if continued long enough, eventuate in permanent changes of form; these may be perpetuated and increased in the offspring, if the producing causes continue to operate; as is instanced in the Cretins of the Valois, and other places. Persons living in the gloomy valleys among the Alps, and other mountainous regions, become subject to an enlargement of the thyroid gland, called goitre; the continued operation of the causes that produce this, with the union of goitrous parents, produce the same result in the offspring, with the addition of a disease of the brain and osseous system called cretinism; it is marked by an enlargement of the head, and loss of intellect. The same doctrine will apply in explanation of the origin of other hereditary affections; for example, scrofula, gout, consumption, mania, and others. They are all liable to be continued and increased to an indefinite extent, as long as theis causes continue to operate; and they will sometimes even continue for several generations after their first causes have been removed.

"We know," says Haller,* "a very remarkable instance of two noble females, who got husbands on account of their wealth, although they were nearly idiots, and from whom this mental defect has extended for a century into several families; so that some of their descendants still continue idiots in the fourth and even in the fifth generation."

The characteristics of hereditary morbid states, however, differ from those that distinguish varieties in many particulars. The causes and effects of disease are more active; destroying the subjects of them in the course of a few generations, at most, if continued; and being removed, the system shows a greater alacrity in returning to the regular condition. Variation, on the other hand, is of an exceedingly chronic character, commonly taking many ages to be produced, and upon the causes being removed, requiring great length of time to pass away.

Animals, under the undisturbed guidance of their instincts, are almost invariably healthy; in a state of domestication they are more apt to become diseased, and to run into varieties; and the nosological distinctions of man are about as preeminent as his other attributes. Nearly all the diseases of the mind, nervous system, cutaneous sur-

* Elements of Physiology; lib. 29. Sect. 7. 38.

face, and teeth; eruptive fevers, hemorrhages, and prolapses; cancerous and venereal affections, and gout, are peculiar to man; he certainly has not in these particulars a very enviable distinction! Whence does it arise? not from the necessity of things, or the inevitable laws of God; for all His laws conspire to a beneficial end; and all the evil in the world is the result in some shape or other of their misappliance or perverted use. The vicissitudes of weather, storms, earthquakes, and volcanoes; all the materials and conditions of the universe, perform useful parts in the grand design of the creation; but they may become—as also the necessary elements of fire, air, and water—under certain circumstances, prolific of destruction. Our faculties have been conferred upon us to enable us to avoid the evil, and select the good; we are unable to do this completely however, from their imperfections; we should therefore labor to improve them; study the laws of nature and of God, (they are identical,) and learn to adapt our conduct to them. Thus only can we improve our present lot.

The organization of man is not more defective than that of animals; nor of itself more liable to disease. On the contrary, man is the master piece of organization; though it will be granted, that from his higher, and more complex endowments, the operations of his economy will, when exposed to deranging causes, exhibit a greater variety of morbid phenomena.

That neither climate, change of weather, nor the seasons, necessarily produce disease is evident; for we find by proper arrangements in our diet, clothing, and habitations, their tendency to disturb the health can be counteracted, and commonly is so; for, of the masses of mankind exposed to their effects at any one time, comparatively few suffer from them. Neither is malaria, as we generally meet with it, though commonly considered the grand efficient of periodic diseases, of itself capable of engendering them; for we do not observe that degree of regularity in its operations which is necessary to constitute a single cause; many people being at times insusceptible of its effects.* We see, then, that to derange the health, something superadded to these causes, a predisposition to be affected by them, is required; which predisposition is constituted by a wrong condition of the solids or fluids of the body, dependent upon their wrong nutrition, and most

* See Appendix on Malaria.

commonly occasioned by erroneous diet. In fact the causes of disease are two-fold, predisposing and exciting.

It may seem foreign to this subject to discuss largely that of etiology; but as the principal object of these few pages is to assist in making known some of the most important rules of health, it becomes necessary and proper to explain to some extent the doctrines of the causation of disease. It is a subject of considerable intricacy; the origin of morbid action being seldom single; and commonly depending on very many causes; and the just discrimination of them is by no means an easy task.

Medical writers call the causes of diseases remote and proximate; the latter is nothing but the deranged action constituting the disease itself. Remote causes are divided into predisposing and exciting ones, each of which may, and usually does, consist of a variety of antecedent circumstances, each constituting a link in the chain of causation.

Predisposition is that peculiar habit of body, or constitution of the components of it, that is favorable to the production of the disease; and predisposing causes are all those things that may develope that predisposition. The operation of the exciting causes is more immediately precedent to the disease; they ignite, as it were, the train that the predisposing causes have laid in the system. Being, frequently, the close predecessors of a disease, these latter are popularly looked upon as the main producers of it; whereas, in reality, they are, most commonly, the least operative, the predisposing causes having brought the system so near the disease that very slight exciting causes are sufficient to develope it. Predisposition is mostly the result of dietetic errors.

The absence of one of these causes will usually render the other inoperative; hence it happens that those causes that are sometimes followed very closely by disease appear to be at others tardy or altogether inefficient in exciting it. We should be, therefore, careful in concluding that certain usages and circumstances are right because they sometimes are not followed by ill consequences; for other links in the chain of causes, necessary to excite those consequences, may be wanting. For instance, contagion and malaria will generally only produce their peculiar effects upon the system when it is predisposed to be acted upon by them; at other times they "pass by us as the idle wind which we regard not." Thus it is that isolated

facts are sometimes a fallacious guide. For the ascertainment of correct dietetic rules, we should observe upon an extensive scale; this would teach us that, for the avoidance of disease, the diet should be adapted to the climate and season, upon the principles here laid down, though some few isolated instances may seem to teach another doctrine.

Physicians a few generations ago used to attribute every departure from health directly or indirectly to error in the "non-naturals;" by which term they meant those things that are necessary to our existence, yet do not form a part of our natural bodies. They enumerated six of them—diet, air, exercise, sleep, the excretions, and the passions. There was much of truth and reason in this way of considering the subject, and it is now too much laid aside. A proper attention to these things, the non-naturals, conduces to the preservation of health.

As this is an important practical part of the subject, I will speak of erroneous diet as a cause of disease a little more specifically.

Errors in diet have, at all times, been considered the most fertile source of sickness. Contaminated air, filth, ill clothing, cold, damp, mental depression, fatigue, the passions, &c., are all, doubtless, frequent causes of disease; but they yield in efficiency to erroneous diet; not so much, perhaps, as being less potent, but as less widely spread and suffered under.

The following quotation from the pathology of Jean François Fernel,* a prominent French physician of the 16th century, well explains the force of diet in engendering disease: "*Maximam in gignendis morbis vim obtinet, pabulum, materiamque morbi suggerens; nam nec ab aere, nec perturbationibus, vel aliis evidentibus causis morbi sunt, nisi consentiant corporis preparatio, et humorum constitutio. Ut semel dicam una gula est omnium morborum mater, etiamsi alius est genitor. Ab hac morbi sponte sæpe emanant, nulla alia cogente causa;*" i. e., It possesses the greatest power in engendering diseases, yielding them materials and aliment; for neither do diseases proceed from air, nor perturbations, nor any other evident causes, unless the preparation of the body and constitution of the humors concur. So that I may say the throat is the mother of all diseases, although some other cause is the father. By this alone diseases frequently arise, no other cause assisting.

* Pathologia, Liber 1. cap. 2.

The proximate cause of every disease depends upon the faulty nutrition of the part affected; either an improper pabulum is furnished by digestion, or the mode of nutrition is altered by the operation of some exterior cause, as heat, cold, miasms, mechanical and chemical causes, and influences operating upon the nervous system; for I hold that, as long as parts are constituted right they will perform their functions right; and if, in this latter respect, any thing go wrong, it is a sign of some error in the constitution, or state of being, of the part affected. Lesions of innervation, merely as such, I cannot consider as capable of being the proximate cause of diseases; nutrition, and not innervation, is the true starting point of animal, and indeed all organic function, both healthy and diseased. Before a function can be performed it is necessary that the organ should exist; and before a function, previously healthy, can be deranged, it is necessary that the organ be depraved. This error in nutrition is either in quantity or quality; it may be excessive, deficient, or depraved. The first perceptible effect of the wrong nutrition of a part is an alteration of its vital manifestations; this is succeeded by a change of structure. When the disease depends upon wrong general alimentation, the nature of the affection will frequently point out the dietetic error; and on the other hand, the error may sometimes lead to an anticipation of the disease; thus they may mutually explain each other. For instance, one of the offices of the liver is to act as a *diverticulum* for the escape of carbon and hydrogen not needed for respiratory purposes, which it secretes as superfluous bile, and thus relieves the lungs from too much labor, and the body from too much heat; hence, in hot weather, excess of these elements in our food and drink is very apt to excite the liver to undue efforts; and it may consequently become inflamed; or if it do not act sufficiently the lungs may be called upon to consume the surplus carbon, the blood may become diseased, and fever be the result.* When cold weather tasks the lungs, a too stimulating diet is apt to excite disease in them.

What is called sympathy, or the consent of morbid action between distant parts at the same time, is very frequently dependent upon a disordered condition of the blood, which produces various derangements of function.

Most forms of fevers and inflammatory diseases, effusions, hemorrhages, and vascular and cardiac enlargements may arise from ex-

* See Appendix, No. 1. Theory of Fever.

cessive stimulation and nutrition. These states are relieved by what is called the antiphlogistic treatment, and by remedies that carry off the bile. Some of the low forms of fever may depend upon a depraving and insufficient diet, and be rather marked by inanition than repletion; here the former treatment would be injurious.

Inflammation of the fibrous and gelatinous tissues, as gout and rheumatism, may be excited by the excessive use of corresponding articles of food, especially if accompanied by vinous stimulants. They may be relieved by the diminution or entire abstraction of animal food and vinous drinks.

Dyspepsia most commonly proceeds from overburdening the stomach; the best remedy is then to give it rest by abstinence.

If our food be not of too stimulating a character, and fever be not excited, the excess of carbon and hydrogen may to some extent be stowed away in the form of fat throughout the body, as a hoard of materials for respiration; a wise provision, as the demands for animal heat are usually great and unintermitted beyond all other wants of the system. There is no such reservoir for superfluous nitrogenized elements otherwise than a state of plethora; in this state therefore, for the avoidance of disease, all these elements not needed for nutrition, must be thrown off by the various emunctories adapted to that purpose, of which in the normal state, the kidneys are the principal; hence excess of highly nitrogenized food, that is flesh &c, is apt to overwork the kidneys, and bring on inflammation and organic diseases in them, *albumenuria*, and the general ill habit of the body dependent thereupon. If the emunctories be unable to throw off the surplus, diseased condition of the blood, and ultimately death may ensue.

Diarrhœa and cholera morbus are frequently salutary efforts of nature to relieve plethora, and throw off offensive matters; they should not, therefore, be always stopped immediately; but after the above object has been fulfilled, should the morbid irritation continue, it should be allayed; for this purpose a mild anodyne will commonly be sufficient. From the engrossing importance of the subject of epidemic cholera, and the errors prevalent concerning it, I have thought proper to treat of it in a separate appended chapter.

Diseases of the brain frequently arise, and may be anticipated from the use of articles that have an effect in exciting and disturbing the circulation and nutrition of that *viscus;* as intoxicating and narcotic articles.

Gastrodynia and pyrosis may arise from the use of unnutritious articles and insufficiency of animal food in cold climates and weather; whereby the stomach becomes overburdened by the bulk of the materials to be digested, and necessary to supply the elements of warmth and nutriment; it consequently falls into a wrong and painful mode of action. These affections are prevalent in Ireland and Scotland among the poorer people, with whom poverty of diet is a too common occurrence.

Diseased lungs are exasperated by an animal diet, and pacified by one of an opposite kind; this is occasioned by the greater or less demands that these diets respectively make upon them for the performance of their function. "The celebrated diver Mr. Spalding, observed that whenever he used a diet of animal food, or drank spirituous liquors, he consumed in a much shorter period the oxygen of the atmospheric air of his diving bell; and he therefore learnt from experience to confine himself upon such occasions to vegetable diet. He also found the same effect to arise from the use of fermented liquors; and he accordingly restricted himself to the potation of simple water. The truth of these results is confirmed by the habits of the Indian pearl divers."*

I have sometimes found the vegetable regimen of itself materially to keep off attacks of asthma; and to be very necessary towards a perfut cure of that disease, in aid of other treatment.

The lungs throw off offensive effluvia when the system is under the influence of intoxicating drinks, or excess of animal food. The odour of the breath affords a valuable indication of the condition of the blood, though one that is but little attended to. It generally gives early admonition of a state of repletion, which if neglected is apt to be followed by disease. The breath in a state of health should always be sweet, unless impregnated with the smell of certain vegetable matters that have recently been eaten.

Sea scurvy, and *purpura* are diseases of the blood, (probably septic) commonly arising from the use of unwholesome and irritating articles of food, as bad and salted meats, and breathing a damp and impure air; they may be accompanied with inflammatory action, or debility, to suit which their treatment should be modified. The same remarks apply to scorfula; remedially a supply of wholesome vegeta-

* Paris on Diet.

ble food, cleanliness, and pure warm air are necessary in these cases; they also are effectual preventives; on which account these diseases are rarely seen in warm climates.

Diseases of the skin are much under the control of dietetic regulations. They may be occassioned by excessive, defective, or improper nutriment; especially when combined with filth. Excessive use of animal food in warm weather is a fertile source of many of these diseases. Correction of the error in these particulars is always necessary, and will frequently alone be sufficient, to effect a cure.

What are called malignant diseases, such as the varieties of cancer, are connected with constitutional disorder, and manifest themselves by excessive and depraved nutrition of a part. They are probably much occasioned by the undue use of animal food; and are generally mitigated by the vegetable regimen, though commonly incurable.

Colic is commonly a consequence of the digestive function being disturbed by excesses in diet. It is sometimes, probably, a form of cœcal dyspepsia, occasioned by undigested vegetable matters. Excessive use of flesh prevents the digestion of vegetable food by rendering the organs unaccustomed, and therefore less fitted to act upon it; and when sufficient aliment is taken in the form of meat, vegetable matters, from their greater indigestibility, will be apt to be left undissolved. Over-stimulating food of any kind will render the stomach incompetent to act properly upon simpler aliment.

"Abercrombie relates a case of a young gentleman who had been for many years a martyr to stomach complaints, seldom passing a day in which he did not suffer greatly from pain in the stomach, flatulence, acidity, and the usual train of dyspeptic symptoms; and in particular, he could not take a bit of vegetable without suffering from it severely. He had gone on in this manner for years, when he was seized with complaints in his head threatening apoplexy: which after being relieved by the usual means, showed such a constant tendency to recur that it has been necessary ever since to restrict him to a diet almost entirely of vegetables, and in very moderate quantity. Under this regimen, so different from his former mode of living, he has continued free from any recurrence of the pains in his head, and has never been known to complain of his stomach." Contrast this with a case of a similar character, of a young nobleman, related by Dr.

Paris, in his work on diet, where the unpleasant symptoms excited by vegetables and a mixed diet, were sought to be prevented and remedied by a diet of animal food; though the use of fruits by themselves could be freely indulged in without unpleasant consequences. The patient ultimately died of disease of the heart, doubtless excited by a too stimulating diet. We cannot fail to be struck with the greater propriety of the plan pursued in the former case.

Decayed teeth and tooth ache are commonly caused by hot food, by passing suddenly from the cold into heated rooms, and the exposure of the teeth to the direct rays of the fire. Their hard and dense substances are badly adapted to withstand the effects of sudden changes of temperature upon their organic parts; especially changes from cold to warm. Their fine vessels being incapable of expansion upon the increased determination of blood to them excited by the heat, is probably one reason why disorganization is apt to ensue; pérhaps from the *error loci* of the old pathologists. The aching occasioned by this cause previous to disorganization, is relieved by washing the mouth with cold water. Excessive stimulation, particularly by alcoholic drinks, also occasions diseased teeth. Man is almost the only being that suffers from tooth ache, and the only one that uses hot food, and fermented drinks.

Improper liquid aliments are of course as liable to produce disease as solid matters. Their effects will be referred to in the next chapter.

There can be no doubt that nine tenths of our ailments proceed from excesses of one kind or another, and may be remedied by timely abstinence and moderation. It is an old and true remark, that if men understood the art of fasting, there would be but little occasion for the physician. All our diseases depend in some way or other upon our own errors or those of our ancestors.

From what has been said we can see how change of climate may relieve or cure many morbid states; for instance how warm climates by requiring but a small consumption of carbon in the system, may quiet diseased lungs; how cold ones, by increasing that consumption, may pacify the liver; how warm weather, from the consequent increased perspiration, may relieve the kidneys and urinary apparatus; how scrofula and scurvy should more seldom occur in warm climates; fevers and fluxes more frequently; but I will not enlarge upon this point.

I have said thus much concerning the causation of disease by food, &c. (somewhat incidentally perhaps,) principally to impress upon the non-professional reader the necessity of moderation and adaptation in diet.

CHAPTER VII.

OF DRINKS, LIQUID ALIMENTS, STIMULANTS, &c.

Food may be liquid or solid; liquid food is provided in various forms for our use by nature and the hand of man; and exercising the same influences upon the animal economy, it is as necessary that it should be adapted to climate, season, and other circumstances, as solid food.

Water is the universal diluent provided by nature for man and animals. Having no other effects upon the system than those proceeding from dilution and evaporation, I shall say nothing more upon it than that it is the best refrigerant we can take when the system needs cooling, and the most wholesome and effectual means of allaying thirst. The vegetable juices used by man consist principally of water, and are generally analogous to it in their effects; being mostly acidulous, and containing but little nutriment, or of the elements of respiration, they are commonly cooling and antiseptic. They are less adapted to our general use in cold climates; where, accordingly, they are not produced; and more in warm, where they abound.

The effects of the vegetable infusions in common use, as tea, coffee, chocolate, &c. besides those dependent on dilution, are owing to the materials infused and to their temperature. Hot fluids, especially in cold weather, brought in contact with the teeth, are very apt to excite destructive inflammation or caries in them; to this cause is greatly to be attributed the prevalence of this affection in our climate. A temperature of any of the ingestæ much above that of the stomach relaxes and debilitates that organ, and may inflame it. Sugar, cream, and the fatty particles of chocolate have been already alluded to in the chapter on animal heat; their quantity in these preparations being usually very small, their effects cannot be very decided; still they should not be altogether overlooked. Tea, coffee, and chocolate contain three analogous principles, theine, caffeine, and theobro-

mine, perhaps the most highly azotized of all vegetable substances; they may, therefore, be capable of contributing to nutrition where an animalized or highly azotized diet is not made use of; and it is remarkable that we have learned their use from the vegetable eating races of warm climates; to them these articles are almost necessaries; to us, combining their use with animal food, mere superfluities; and probably frequently injurious ones; especially when indulged in excessively, or of too high a temperature.

Tea and coffee are nervous stimulants, producing exhiliration and wakefulness; their use is therefore counterindicated in certain cases of cerebral and nervous irritability; especially in children who are constitutionally more prone to nervous irritability.

Milk and soups are capable of contributing both to the nourishment and dilution of the system. They may be, and usually are, somewhat analagous in their character, being both composed of water mixed with animal and vegetable matter. When taken into the stomach, their watery parts are absorbed, and the more solid residue undergoes the usual process of digestion. The soups, with regard to their effects, of course stand in the same predicament as the substances, animal or vegetable, of which they are composed. Of these I have already, perhaps, said enough.

Milk constitutes the natural food of all the mammaliæ during the early period of their existence; and in general no change occurs in their organization or functions at any subsequent period to render it unwholesome. It contains all the elements necessary to the animal organism. It usually consists of fat, sugar, caseine, some salts, and water. When introduced into the stomach, it undergoes coagulation by the solidification of its caseine. It partakes largely of the character of the food it is drawn from. The milk of purely carnivorous animals is said to be destitute of sugar; consisting, like their aliment, of proteinaceous and fatty matters, with the usual salts and water.

Man has used the milk of the *herbivoræ* from very remote times; but never, I believe, to any extent, that of the *carnivoræ;* this would, I have no doubt, partake of the properties of the aliment it is composed of, and be, like animal food, too stimulating for his use under a warm temperature.

The injurious effects of breast milk on infants, when the nurse uses more animal food than is necessary for the temperature she and the infant are exposed to, depend upon its being too highly animal-

ized. This is a too frequent condition of it; hence proceed much of the fevers, fits, eruptions, bowel complaints, and other irritative diseases of infants. This is a subject that has hitherto received but little attention, though of the most vital importance. The tender infant is generally well wrapped up, and kept carefully warm; as warm, or nearly so, as if it dwelt in a tropical climate; the mother, also, is seldom exposed to much cold, at least during the early period of her babe's existence; but her diet is too frequently of a very stimulating character; as much so, indeed, as would be required were she exposed to a rigorous climate. A vegetable diet is seldom recommended to, or pursued by nursing women; and yet, in the early part of the time, which is passed in warm rooms, with little exercise, it is clearly indicated. Can it be wondered at, then, that both parent and child should be so liable to fever and inflammatory attacks, and that they should so frequently fall victims? The circumstances of an infant newly born, and also of the mother in the early periods of lactation, are those that call for vegetable, or milk supplied by vegetable diet; and if these indications be not to a certain extent complied with, both are apt to suffer ill effects; more especially, however, the child. Sir George Mackenzie, in his history of Iceland, remarks that, in an island near Iceland, where no vegetables are to be got, the children invariably die of *tetanus* before they are three weeks old, and the population has to be kept up from the main land.

It used to be customary in the West Indies to allow an extra quantity of animal food to the Negro women after confinement; these, too, entertained great prejudices against allowing cool air and water to come in contact with their infants. In consequence of this management, *tetanus*, or jaw-falling as it was commonly called, was of frequent occurrence before the child was nine days old, and always fatal; cool air and bathing were, however, effectual preventive means.

Milk, partaking of the character of the nutriment it is derived from, becomes imbued with alcoholic particles when the food is mingled with liquids of that nature. Hence the diseases of vinous stimulation are liable to be ingrafted upon the infant, whose nourishment is imparted by a nurse addicted to fermented liquors; and besides the formation of an attachment to these stimulants may be thus early laid, which may, in time, progress into habitual drunkenness. The supposition that stimulating potations are favorable to lactation has been a most fatal error, and one that has been the means

of introducing much disease and vice into the world. It has polluted natures fountain at its source. Fortunately the idea is now pretty generally exploded.

Spirituous liquors of any kind, when used in a state of health, are very apt to prove injurious. Taken into the stomach, they undergo no digestion, but are at once absorbed into the blood, where they become highly stimulating; and, containing nothing adapted to the healthy nutrition of the body, they task the vital powers to throw them off as fast as possible; but, containing hydrogen and carbon largely, in a form appropriate for absorption, they are capable of subserving the purposes of respiration more promptly than any other articles, and are, therefore, adapted to the stimulation and calorification of the system in those low forms of fever in which digestion is suspended, as the latter stages of typhus. They have been usually considered as tonics, but this is a perversion of the term, for they confer no strength, but merely stimulate and heat the system. When not called for, or indeed at all times, they are apt to produce too high excitement, and subsequent prostration, and are liable to kindle disease of almost every form, and in any part of the system.

The blood, when impregnated with spirituous particles, appears to have a peculiar effect upon the brain, and the sensorial functions become much modified by it. To this effect, probably, and the facility of obtaining the means, is the general adoption of this mode of excitation owing. Under its influence, pain, danger, and, in short, all disagreeable emotions, diminish or disappear; and in their place, emotions of a contrary kind ensue; and very frequently, complete insensibility. The inhalation of several spirituous substances, as ether, chloroform, &c., appear to act similarly, though their effects are far more evanescent. These spirituous matters, then, seem to be capable of permeating the tissue of the lungs either by *endosmose* or *exosmose;* for, as has been before remarked, they may be evolved in respiration.

There is some analogy in their effects upon the system, between spirituous and vinous liquors, and animal food. They are both powerful stimuli, contain carbon and hydrogen largely in a form fit for respiratory purposes, and are therefore capable of heating the body and enabling it to withstand low temperatures; on the same accounts they are both liable to excite undue and morbid action when circumstances do not require their use; the circumstances requiring their

use may be cold, and exhaustion by famine, sickness and labor; even under these conditions stimulating liquors should be used cautiously, lest the standard of healthy reaction be transcended, and a morbid one set up. In these conditions, when the digestive powers are at all active, the well proportioned use of animal food is commonly better adapted to produce the requisite effects; for it at once nourishes, strengthens, stimulates, and warms; while fermented and spirituous liquors are principally confined in their effects to the twolast; and being very transitory in their effects, and ultimately debilitating, they are apt to leave the system in a worse condition than it was in before.

Excesses both in animal food and fermented liquors conduce to the production of inflammatory scurvy. Huxham remarks:* "I find this disease chiefly among those who drink heavy fulsome malt liquors, such as we generally have in this country, (England,) who eat very few vegetables, and live mostly on flesh and fish; that lead inactive lives, and indulge too much in ease and appetite. Many of our sedentary tradesmen very often fall into it, when they constantly drink the gross ale and beer of this country, and live chiefly on fish and salt provisions. On the other hand, the active laborious husbandman, who drinks chiefly cider, eats much herbage, fruits, &c., and breathes a free open country air, seldom or never is affected with it."

Like that of animal food, the use of spirituous liquors is more tolerable in cold climates than in warm. Montesquieu remarks, "Go from the equator to our pole and you will find drunkenness increasing together with the degree of latitude. Go from the same equator to the opposite pole, and you will find drunkenness travelling south, as on the other side it travels towards the north." It is principally a vice of cold climates; a habit less injurious there, and mostly carried into warm climates by adventurers from the north; where the excitation of warmth constitutes a redeeming feature in its effects; but in warm regions its use in health is an unmitigated evil, and a mere source of depravation to body and mind. That quantity of liquor that will warm a Russian, will make a German stupid, and an Italian mad.

Alcoholic liquids are, however, a dangerous and deceitful means of counteracting cold, as their effects soon subside, and the powers of life then sink as much below the regular standard as they were be-

* Letter to Dr. Lind.

fore elevated above it. In this condition a fatal prostration may ensue.

But it has been remarked that, in warm climates, those who confine themselves to water as a drink are nevertheless sometimes subject to the active forms of fever that there prevail. The reason of this is that their appetites are keener, and their digestion is better, than they are with those who render the energies of their stomachs dull by spirituous drinks; and they consequently are liable to indulge too freely in animal food. They may almost as readily eat themselves into a fever, as drink themselves into one. With habits right in both respects, I have no doubt that people could accommodate themselves to almost any climate without difficulty.

Over stimulation, either by eating or drinking, is the same or nearly so in its effects. As has been already said, most of our diseases are the results of it; and it is easy to see how they are so; for all the healthy vital manifestations are the results of well proportioned excitation; but when the stimulus is inappropriate either in kind or degree, it necessarily leads to improper performance of function. When the fluids are accumulated to the utmost that the containing vessels will allow by abundant nutrition, and the circulation is urged to undue rapidity by excess of excitement, the most favorable state exists for the origination of inflammatory and congestive affections, hemorrhages, extravasations and effusions; and when the excitement has died away the powers are to some extent exhausted, and the system is particularly apt to suffer from almost any deranging cause. Contagion, miasm, cold, checked perspiration, or any other secretion, can then produce their effects almost without resistance. These affections constitute most of the diseases the body is liable to; and intemperance in drinking is more apt to favor their production than intemperance in eating, because its effects are more intense, sudden, and eventually exhausting.

Some diseases are peculiarly the result of the use of alcholic stimulants, and it is remarked that these diseases, though of frequent occurrence in Europe and North America, are unknown in more temperate nations. Among these affections are gout and stone. These diseases are only found in those countries where intoxicating liquors are freely used. Dr. Ure, in alluding to the frequency of calculous disorders in England, remarks that the cause must be looked for in the use of something from which irrational animals ab-

stain; which, he says, is to be found in fermented liquors, and apparently in nothing else.* Linneus remarks of the Laplanders that they have few diseases, and that the gout and stone are unknown among them; which he attributes to their water, and to their abstinence from all fermented liquors, especially spirits. Rumazini affirms that the Persians who abstain from wine are free from gout and stone; and Tavernier states, "As for the gout and gravel the Persians know not what it means; but the Armenians are troubled with the latter, especially those that in their youth accustom themselves to more wine than water."

Different kinds of vinous stimulants may induce different diseases. Dr. Rush observes in his medical observations, that "physicians have remarked that a number of new diseases have appeared among us since the introduction of spirituous liquors into such general use." In England the consequences of spirit drinking were so serious in 1725, as to cause the College of Physicians to make a public representation of them; and in 1750, when these pernicious poisons were very generally used, the same body stated that they had 14,000 gin cases under their care, most of which baffled all their skill in medicine.†

Even when no very evident organic disease is the result, habitual excess in the use of fermented liquors deadens the sensibilities, obscures the intellect, and depraves the moral feelings; a state of things more truly deplorable than bodily pain and infirmities.

Dr. Beaumont, of the U. S. Army, made some interesting observations on the effects of spirituous liquors, and stimulants in general, upon the stomach, in the case of his patient Alexis St. Martin. This man received a charge of duck shot in his side, which laid open his stomach. After he had recovered there remained a considerable opening into the stomach, by means of which Dr. Beaumont was able, for several years, to make a series of valuable observations on the process of digestion. After Alexis had been indulging for several days in ardent spirits, the doctor found the mucous membrane of the stomach covered with erythematic and apthous patches, the secretions vitiated, and the gastric juice diminished in quantity, viscid and unhealthy, although he still complained of nothing, not even impaired

* Ure's Chemical Dictionary—Art. Calculus.

† Gent's Magazine, vol. 30, p. 21.

appetite. In two days later, matters became worse, "the inner membrane was unusually morbid, the erythematic appearance more extensive, the spots more livid than usual, from the surface of some of them exuded small drops of grumous blood; the apthous patches were larger and more numerous, the mucous covering thicker than common, and the gastric secretions much more vitiated. The gastric fluids extracted were mixed with a large portion of thick ropy mucus, and considerable muco-purulent discharge slightly tinged with blood, resembling the discharge from the bowels in some cases of dysentery. Notwithstanding this diseased appearance of the stomach, St. Martin complained of no symptoms indicating any general derangement of the system, except an uneasy sensation and a tenderness at the pit of the stomach, and some vertigo, with dimness of vision, on stooping down and rising again; he had a thin yellowish brown coat on his tongue, and his countenance was rather sallow, pulse uniform and regular, appetite good, rests quietly and sleeps as usual." A few days temperance restored matters. Dr. Beaumont, after remarking that these symptoms were frequent in the course of his experiments, observes: "Improper indulgence in eating and drinking was the most common precursor of these diseased conditions. The free use of wine, ardent spirits, beer, or any intoxicating liquor, when continued for some days, invariably produced these morbid changes."

Thus we see, from their powerful effects upon the system, the use of fermented and spirituous liquors cannot be long continued without detriment to it; and what is worse, the evil does not terminate with the individual; for it has been remarked that all the diseases arising from their use are liable to become hereditary, even to the third generation; gradually increasing if the cause be continued, till the family becomes extinct.*

Living as we do in the midst of abundance, the great dietetic error to be guarded against is over-stimulation and nutrition. It has been shown how, from the force of habit, the former is perpetually liable to be increased; besides, the use of one kind of unnecessary stimulant begets a desire for another; so that it is important to check our propensities that way in the bud. Plutarch, who was an advocate of temperance and the vegetable regimen, condemns the use of stimulants, as being provocatives of depraved and unnecessary appetite;

* Dr. Erasmus Darwin.

and tells us that the ancients used but two sauces, hunger and salt; all that are needful; for, as he says, the healthy should only eat when they are hungry, and the sick should not be made hungry, for the food would make them worse.

Of salt it may be here remarked, that it is a condiment, necessary to healthy digestion, composed of soda and muriatic acid; it furnishes the soda to form bile, and for other purposes, whilst its acid gives to the gastric juice much of its solvent powers. In warm climates the appropriate food—vegetable—is naturally less saline than the animal diet of the north, and the increased perspiration throws off a greater amount of salt from the cutaneous pores, which must be resupplied to preserve the due constitution of the fluids; accordingly we in these climates find the greatest desire for salt. Mungo Park tells us that the mothers in Africa pacify their children with a piece of salt, as in Europe they do with sugar. In Holland it was formerly a part of the punishment of criminals to be kept without salt; they consequently fell into a diseased condition. Being thus necessary, it is provided by nature for man and animals in all parts of the world; but, as with every thing else, its too free use may be a source of evil. It may over-stimulate and consequently debilitate the organs, and render the stomach averse to act on milder articles; it may also excite a scorbutic condition of the body. Another consequence of excess in its use is, that, being a provocative of thirst, and perverting the taste, it excites a demand for stimulating drinks—the root of so much evil in the world—doubtless this cause has aided in producing many drunkards; the same may be said of many other condiments.

CHAPTER VIII.

ILLUSTRATIONS, PROOFS, MISCELLANEOUS OBSERVATIONS, &c. ON THE PRECEDING DOCTRINES; AND CONCLUSION.

If there be any truth in the dietetic regulations here laid down, we should of course expect to meet with an increase of disease, not only in those climates, but also in those seasons, wherein these rules are least observed; and such we find to be the fact. Our hottest months are generally the sickliest, and our coolest are the healthiest. This is so commonly the case, that people are led to the conclusion that

warm weather is naturally and necessarily sickly; an erroneous one however, as more extended observation might convince us. Now if we enquire into the general dietetic habits of our people in the different seasons, we shall find that a more stimulating, heat engendering course is frequently pursued in the warmer months than in the colder. It is notorious that more stimulating drinks are used during the former; and the following table goes to show that more animal food is also then used; it is a carefully prepared statement of the amount of live stock received monthly at the Philadelphia cattle market during the year 1847; and that city it will not be supposed is singular in respect to the dietetic practices of its inhabitants.

	BEEVES.	COWS & CALVES.	SHEEP.	SWINE.	TOTAL.
January,	3620	950	1900	3800	10270
February,	3650	900	1459	4150	10150
March,	4000	1070	1425	4530	11025
April,	4590	1570	2590	5190	13940
May,	4240	1080	3280	3740	12340
June,	5570	1120	4030	5350	16070
July,	4070	1040	3970	4800	13880
August,	4100	970	3600	5560	14230
September,	4420	1060	3340	5370	14190
October,	4560	890	3620	5190	14270
November,	4280	1140	3570	4860	13850
December,*	4450	1200	3640	4590	13880

From a series of observations by Dr. Emerson, embracing a period of twenty years, the relative mortality of the different months in Philadelphia stood as follows—the months being equalized and presumed to consist of thirty one days each.

Aug. 6632	June, 4699	April, 4370	Jan. 4112
July, 5889	Oct. 4554	Nov. 4361	Dec. 4072
Sept. 5309	Mar. 4371	Feb. 4283	May, 3892

By this it appears that the mortality is nearly in proportion to the warmth of the month; and with the exception of the month of May,

* Ohio Cultivator. Quoted from a Philadelphia paper.

the coldest months are most favorable to life. Are we to account for this by supposing that it is a law of man's nature that the temperature most disagreeable to his feelings should be the best adapted to his health? or that it is in consequence of his not adapting his habits of life to the season in the warmer months; and his pursuing the regimen adapted to winter during the heats of summer? Unquestionably the latter furnishes the better explanation.

With correct habits of life, the warmer months would, I have no doubt, be the more healthy, as well as agreeable. According to the observations of M. M. Edwards, Villerme, Trevisen, &c. the mortality of children in the south of Europe, (where a vegetable and fruit diet is much used,) is the greatest in the coldest months, and the least in the warm months at the beginning of summer; though it becomes slightly increased when the extreme heat of summer has endured a considerable time; probably from insufficient attention to dietetic adaptation. With us, the mortality among children in our cities is immensely greater in summer than in winter, from the very erroneous customs that are pursued. As has before been remarked from dread of their use, or inability to procure them, fruits are almost interdicted to our city children, in fall and summer, when they are most beneficial.

Among old people, the mortality is generally the greatest in the coldest months. With this class of persons use has become a second nature. They have taught the system to conform to their habits, which, if regular, no longer derange it; but the declining powers of life are unable to resist the adverse influences of a low temperature, and they consequently succumb to it.

To see further the utter neglect that so generally prevails of any attempt to suit the food to the indications of climate cr of season, contrast the dietaries (or diet tables) of the English paupers, with those for victualling troops for India.

Dietary of the East India Company for victualling troops for India, for mess of six men, per week:

Meat,	40 lbs.	Peas,	5 pints,	Vinegar,	3 pints,
Suet,	$1\frac{3}{4}$ "	Plums,	$1\frac{1}{2}$ lbs.	Tea,	1 lb.
Rice,	3 "	Biscuits,	30 "	Sugar,	6 lbs.
Flour,	10 "	Mustard,	$\frac{3}{4}$ lb.	Best London Porter,	42 pts.

Some of the pauper dietaries for the cool climate of England, (where, from the extent of pauperism, they are desirous of finding out and giving the smallest amount of food that will sustain human nature,) prescribe about 18 ounces of bread, and 3 ounces of cheese, *per diem*, with 3 or 4 ounces of meat on Sundays only, and water alone for drink. This is found by experiment to be in general sufficient to meet the absolute demands of nature there; but we see that more than twice the amount of nutriment of a more stimulating character, besides a highly stimulating drink, is furnished to the India soldiers, who, from their warmer climate, need these things much less. Need we wonder, then, at the effects of over nutrition and stimulation among the latter.

Too little attention is paid to the demands of season and climate in forming the dietaries of public institutions. There is no instance, as far as I am aware, of any being framed to suit the temperature, although a most essential thing to health. A reform is much needed in this particular; especially in the United States.

Our penitentiaries in particular are prone to be sickly in the warmer months; this is very much the case in that situated at Columbus. In these institutions the most rigid and invariable diet is pursued; and they consequently furnish the most marked evidences of the necessity of change and adaptation in it. The injured or broken down constitutions of the inmates, arising from intemperance and other causes, render them more liable to be affected by deranging influences. The same remarks will apply to some of our alms and poor houses.

As a proof of the connection between the diseases of a country, and the diet there used, we may remark that a change in the latter is followed by a corresponding one in the former.* "We learn from the London bills of mortality, that scurvy raged to such an extent in the 16th century as to have occasioned a very great mortality; at this period the art of gardening had not been introduced. It appears that the most common articles of the kitchen garden, such as cabbages, were not cultivated in England until the time of Catherine of Arragon; indeed we are told that this queen could not procure a salad until a gardener was sent for from the Netherlands to raise it. Since the change thus happily introduced into our diet, the ravages of

* Paris on Diet.

scurvy have been much less severely experienced." It may be said in addition, that this is now an exceedingly rare disease on land; and much less frequent at sea than it used to be, owing to the adoption of better preventive regulations.

According to Sir Gilbert Blane scurvy continued a common scourge in England until the general introduction of garden plants as food, which only began to take place in the reign of Henry the VIII. Up to this period, the common food of the people was salt beef and pork &c, with bread; scarcely any vegetable production being used in the winter season: and in the summer season garden vegetables were exceedingly rare and dear, and only used on Sundays and at festivals. It had not been the custom to lay up hay for the winter season, and cattle were consequently slaughtered in the fall, and the winter was passed upon salt provisions. Macaulay tells us, "in the reign of Henry the VII, fresh meat was never eaten even by the gentlemen attendant on a great earl, except during the short interval between midsummer and Michaelmas. But in the course of two centuries an improvement had taken place; and under Charles the II. it was not till the beginning of November that families laid in their stock of salt provisions, then called Martinmas beef." "The quantity of beer consumed in those days was indeed enormous; for beer then was to the middle and lower classes not only all that beer now is, but all that wine, tea, and ardent spirits now are." In those days, the scurvy, dysentery, and malignant fevers were far more prevalent; and the plague, and *Sudor Anglicanus*, (or sweating sickness,) made frequent, and fearful ravages among the people. Now that more appropriate habits are pursued, these last named diseases, are unknown there; the plague has not occurred for nearly two, and the *Sudor* for nearly three hundred years; indeed of this, nearly all memory has passed away except of its name; we do not know in what the disease consisted, only that it was attended with copious sweating, and was very fatal; confining its ravages to the English in whatever country they might be; doubtless from their more gross and improper dietetic habits.

Fortescue, who was chancellor under Henry VI. of England, in his work "*De Laudibus Legum Angliæ*," draws a striking contrast between the food of the English and French. Of the French peasantry he says their constant drink is water, neither do they taste throughout the year any other liquor, unless upon some extraordinary times

or days. * * * "They do not eat flesh, except in very small quantities, with which they make a soup &c." Of the English, after speaking of their superior wealth, he says: "They drink no water, unless at certain times, upon a religious score, and by way of doing penance. They are fed in great abundance, with all sorts of flesh and fish, of which they have plenty everywhere &c." The antithesis is here strongly drawn, and as the book is written with a national feeling, and to display the superiority of the English laws and constitution, the facts are probably colored somewhat highly; but there is doubtless much of truth in them, and the work has always been held of good authority.

Avicenna remarks that after the famine that occurred in the city of Bochara, many of those who had lived on roots and herbs and retained their health, became diseased as soon as they returned to a full diet of flesh and bread. This was in a thermo-temperate climate. Dr. Paris quotes this as an instance of the ill effects of sudden changes. It is however more illustrative of those of excess; for when people who were healthy upon one system of living, become diseased upon another, it is certainly a fair inference that the former was better adapted to their nature than the latter. Most probably those who did not suffer in their health were not much straightened for food by the famine; but merely underwent a forced, but moderate abstinence; a state of things frequently most salutary.

A remarkable instance of the benefit derived from forced abstinence in warm climates, is related in a work recently published: "A great number of British officers who surrendered with General Matthews, and who were taken in action with Hyder Ali and his son, were long kept in the dungeons of Seringapatam; and it is a curious fact that they returned to the army in perfect health. Now, all they had to live upon was a handful of rice each every day, and a little water. It appears that when these officers were captured, many of them labored under liver complaints, and had, also, received severe wounds; yet, upon getting back to their regiments, after years of confinement in a dungeon, living all the time on rice and water, they found themselves high in rank by the death of their brethren, who had been cheering themselves with good old Madeira, Claret, Champaigne, brandy, together with all the variety of a groaning table."*

The Jewish sect of the Essenes, whose rules forbade the use of

* "Forty years in the world," by the author of "Sketches in India."

animal food, which, in the warm climate of Judea, is scarcely needed, enjoyed a marked immunity from disease, compared with the other Jews, whose diet, for their climate, was apt to be too gross, notwithstanding the salutary restrictions of the Mosaic code in that respect. Of the former Josephus thus speaks: "They addict themselves entirely to husbandry, and is their course of life better than that of other men? * * * They are long lived, also, insomuch that many of them live above a hundred years by means of the simplicity of their diet."

In Kippis' life of Capt. Cook, it is remarked: "One circumstance peculiarly worthy of notice is, the perfect and uninterrupted health of the inhabitants of New Zealand. In all the visits made to their town, where old and young, men and women, crowded about our voyagers, they never observed a single person who appeared to have any bodily complaint; nor among the numbers that were seen naked, was once perceived the slightest eruption on the skin, or the least mark that indicated that such an eruption had formerly existed. Another proof of the health of these people is the facility with which the wounds they at any time received are healed. An additional evidence of human nature's being untainted with disease in New Zealand, is the great number of old men with whom it abounds. Many of them, by the loss of their hair and teeth, appeared to be very ancient, and yet none of them were decrepid. Although they were not equal to the young in muscular strength, they did not come in the least behind them in regard to cheerfulness and vivacity. Water, as far as our navigators could discover, is the universal and only liquor of the New Zealanders." They also subsisted mostly upon vegetable food; and their climate is very mild and equable.

A melancholy change has, however, taken place among these people, and others of the Pacific islands, in consequence of their intercourse with the self-styled civilized and enlightened traders.* Disease and mortality, arising from the introduction of ardent spirits among them, have threatened to depopulate these countries. For instance, the Sandwich Islands, in Captain Cook's time, are estimated to have contained a population of not less than four hundred thousand. The fact is now well known that the population of these islands, at the present time, only amounts to a hundred and thirty-

* Remarks on the Sandwich Islands, by Alonzo Chapin, M. D., late a resident Missionary at those islands.

five thousand. A diminution chargeable to the introduction of the customs and vices of other places.

Barrow, in his "Southern Africa," tells us that "there is, perhaps, no nation on the earth, taken collectively, that can produce so fine a race of men as the Kaffers; they are tall, stout muscular, well made, elegant figures. They are exempt indeed from many of those causes that, in more civilized societies, contribute to impede the growth of the body. Their diet is simple; their exercise of a salutary nature; their body is neither cramped nor encumbered by clothing; the air they breathe is pure, their rest is not disturbed by violent love, nor their minds ruffled by jealousy; they are free from those licentious appetites which proceed, frequently, more from a depraved imagination than a real natural want; their frame is neither shaken nor enervated by the use of intoxicating liquors, which they are not acquainted with; they eat when hungry and sleep when nature demands it. With such a kind of life, languor and melancholy have nothing to do. The countenance of a Kaffer is always cheerful; and the whole of his demeanor bespeaks content and peace of mind."

To show that this happy physical condition is not the peculiar attribute of the races in the two last instances, but that,with appropriate habits, it may be attained by others, I will refer to the accounts of the offspring of the English sailors, the mutineers of the Bounty, on Pitcairn's Island; a mixed breed, to be sure, but their physical attributes appear to have suffered no deterioration from the admixture of European blood. The story is doubtless familiar to many of my readers. Nearly forty years after the colonization of the island, to which the mutineers had fled for concealment, taking with them their Tahitian wives, the little colony was discovered by some vessels accidentally touching there. Only one of the mutineers remained alive, but their progeny was numerous. They used but little animal food, living mostly upon fruits and vegetables. Yams, bananas, plantain, bread-fruit, cocoanuts, appoi, &c., constituted their principal food. The warmth of the climate rendered clothing but little necessary. They rose early and took much exercise. With diet and habits thus simple, "they were a finer and more athletic race than are usually found among the families of man." Parturition was easy, and unattended with danger, not a single fatal case having occurred. The children enjoyed uniform good health; their teething was easily got over; they suffered no bowel complaints; and were exempt from those

contagious diseases from which children suffer so much in large communities. In short, for health, strength, amiability, and innocence, this little community afforded one of the most delightful examples ever offered for the contemplation of the philanthropist.

From gradual improvements in general dietetic practices, in remedial management, and a better knowledge of the laws of life, the rate of mortality in Europe, and probably in our own country, has of late years been undergoing a constant diminution. The average duration of life is now nearly one third longer in England than it was two hundred years ago. In large towns and cities, where the males are usually more intemperate and dissipated than the females, the latter generally enjoy a greater exemption from disease, and live about five years longer than the former; and their lives are usually considered worth about that much more at the insurance offices.

The average duration of life in the British islands is at this time probably somewhat over forty years, and throughout Europe somewhat less; the latter is, I presume, also the case throughout the northern portions of the United States, though I believe we have no accurate data upon the subject. The duration of life is known to be greater in the north than in the south, both in our own country and in Europe; probably the disparity is much the greater in this country, on account of the more inappropriate dietetic usages observed in our southern states, the great vicissitudes of temperature there, and the neglect of all adaptation in diet to suit the wants of the system in the warmer months. The average length of life among the whites in the southern states is, probably, not over thirty years. This state of things, so unfavorable to prosperity and improvement, is attributable to errors in diet, both in eating and drinking; it calls aloud for reformation. Practical attention to these rules would, I am convinced, remedy the evil, and enable the south to rival the north, in this, or any country in the world, in health, prosperity and population. To most of our southern states nature has been prodigal in all the gifts of soil and climate, and of every thing needful to the welfare of man; but used inappropriately, the greatest blessings always become the greatest evils. Intemperance in our southern states is notoriously more prevalent than in any country in the world of equal warmth; the numbers of its victims are incalculable; they are of all classes, the rich, the poor, the ignorant and the enlightened; surely these last, when they can see and understand the evils that threaten all

that should constitute their dearest hopes, will make an effort to avert it.

Were it not for our vicious habits, I have no doubt that the age of man would be in general what the psalmist says of it, and extend to three score and ten years.

It has now been made sufficiently apparent, probably, that man's constitution is particularly adapted to a warm climate and a vegetable diet; and that such was his primeval state; that the extension of his race into the colder regions has begot the necessity for the use of animal food, which should accordingly be principally limited to the necessary purposes of combining warmth with nutrition; that in the very cold climates it must be used largely; in the very hot ones abstained from entirely; and in the variable ones, the diet should be adapted to the season. That warm climates and weather, with their appropriate regimen, are not in their nature sickly. That diversity of circumstances, especially as to food and climate, conduce to the production of varieties; and adversity of circumstances, to disease. That the temperate climates, and the mixed diet there used, due adaptation being observed, are not detrimental to the human race. That in his present state, having lost much of the control of instinct, man must depend more upon the control of cultivated reason. That the use of spirituous and fermented liquors is improper in a state of health, and apt to be subversive of it. That over excitation is the source of most of our diseases; and temperance and due adaptation in all things the best preventive of them.

The modern epicure, and the votary of custom and of fashion, will be apt to complain of the stringency of these rules; to them appetite, habit, and custom are imperious, and must be bowed to; they consequently will continue to indulge in stimulating food and drink, at all times and seasons, without regard to reason or the wants of the economy. With these confirmed sensualists we do not look to prevail; they must be taught by their sufferings, and be convinced, perhaps, when it is too late; when the greatest boon the outraged laws of nature can bestow, may be a premature death. It is to those only who can listen to reason and regulate their conduct by it, that these remarks are addressed; these have always constituted the fewest number among men; hence it has been the fate of truth and reason to make slow progress against established errors.

I have endeavored to make known the right, not mincing the mat-

ter, as most of our popular writers on diet do; who half condemn, half palliate, established errors. This lukewarmness—this being neither one thing nor the other—is a fallacious course, and one, it is said, that "neither Gods nor men endure."

Let no one condemn these rules because he may have seen some few instances of their infringement without the consequent penalty of disease; for erroneous habits may sometimes be tolerated for a while; some organs taking on themselves the office of casting out offending matters; and in this way the system may get along tolerably well for a time; but sooner or later the overtasked organs will become diseased; in the majority of cases this tolerance of improper articles of food and drink is not established; the constitution has not the strength, nor the organs the complacency, (if I may use the term,) to get rid of the offending matters; and the health suffers more immediately.

Under the influence of congenial habits, the feelings are apt to give timely intimation of the presence of morbid causes, and intimate the proper course for their removal; these nice perceptions become deadened under the influence of uncongenial habits. Intemperance in eating and drinking has a great effect in deadening these perceptions; and so depraves the appetite, that it becomes a very uncertain informant of the real wants of the system.

I do not indulge in the Utopian anticipations of the benefits to flow from dietetic reform that some have done. Correct diet alone is not going all at once to make men healthy, wise, and virtuous, as some declaimers would have us suppose. Under the best of circumstances there will always be considerable infirmity in human nature, and human conduct, and all that can be reasonably expected is, that correct habits will place us in the best condition our present lot admits of.

Those who may have deranged their health by improprieties in diet, and who may feel induced to seek a remedy in the adoption of the advice here given, I would caution not to indulge in extravagant expectations; perverted functions, the results of protracted errors, are not to be corrected immediately upon the abandonment of the practices that have occasioned them; for they have probably become habitual. Diseases are commonly proportionally slow in their occurrence and removal; let the convert to correct practices persevere, however, and he will hardly fail in due time to reap his reward; but if the constitution be exhausted and broken down by over excitation,

it would be folly to expect a reformation of conduct to reform the body; it is too late!

To those in health, who, from what has been said, may renounce the usual routine of eating and drinking, forego excessive stimulation, and endeavor to adapt their aliment to their real wants, and to the requirements of climate and of season, I would remark that they may expect difficulty in contending with their habits in proportion to their inveteracy; and that the abstraction of a stimulus must be expected to be followed by some degree of depression and debility; but this is only temporary; the system will soon accustom itself to the new state of things; and its various functions will then be performed more pleasantly and evenly than before.

If half the pains were taken to acquire correct habits that are sometimes bestowed on learning vicious ones, the latter would seldom acquire the ascendancy. In all our contests between reason and appetite, let us remember that by every triumph of the one, the other becomes weakened, and less able to obtain the mastery. How important, then, is it that reason should prevail; seeing that otherwise appetite must usurp its place! How doubly important, too, that reason should be properly guided! not only for its present good; but as a perpetually increasing source of benefit. The undue indulgence of passion and appetite, on the other hand, is not only a temporary evil; but a source of continually increasing suffering and degradation.

This little book, I deem, if rightly used, would constitute a safeguard in a sickly season; and form the best passport a man could take with him, should he visit foreign climes—a protection against the exactions of the king of terrors—exactions that those who visit the tropics, or warmer regions, are, under present circumstances, exceedingly exposed to.

Prevention is proverbially better than a cure; and rules calculated for the avoidance of an evil, have stronger claims upon the attention of mankind, than any remedy that can be proposed. This is my apology for casting these remarks upon the world.

APPENDIX No. 1.

ON MALARIA, ITS EFFECTS AND ANTIDOTES. THEORY OF FEVER &c.

On the subject of miasms, or the volatile infecting agents proceeding from decomposing animal and vegetable matters, there appears to me to be much misapprehension. They are commonly viewed as influences positively and neccessarily injurious to the animal economy; capable of themselves of exciting diseases of a peculiar character under all conditions of the system; and as constituting the sole object of attention and avoidance to enable us to escape those diseases. This way of viewing the subject is erroneous and mischievous; nor is this the only prevalent misunderstanding upon it; let us therefore devote a few minutes to its consideration.

The science of medicine certainly recognizes predisposing, as well as exciting causes; the thing I deprecate is the general practical forgetfulness of the former that obtains. We do not take the trouble of discriminating; and are too apt to allow exclusively to the occasional, a power that should be divided with other causes.

There is no branch of the medical sciences on which more vague and unphilosophical doctrines are inculcated, even *ex cathedra*, than on that of etiology, or the causation of disease. The invariable attendance of the sequent upon the antecedent circumstances, neccessary to invest the latter with the essential attribute of a cause, is very commonly lost sight of; two obvious facts alone are noticed; for instance, the exposure to a miasm, and the supervention of a disease; and the consideration of the intermediate circumstances necessary to the result is neglected. These two prominent facts are arbitrarily coupled together, as absolute cause and effect, by some observers, while others, noticing that the alleged result sometimes fails to appear, plunge into the opposite error, and deny all etiological connexion between the facts in question. Hence much of the prevalent obscurity and contradiction in this part of medical science; and of the disputes about the potency of certain agents; as those concerning animal malaria as a cause of fever; and the existence or non-existence of numerous contagions; disputes which have long divided, and still divide the medical world; some contending for an absolute efficiency in these things, and others altogether denying their powers. The

editors of an approved work on medicine* have cut this Gordian knot, and thus solved the difficulty, by denying the applicability to the science of medicine of the axiom "a like cause, under similar circumstances, will produce a like effect." Thus removing the foundation of all rational science from medicine, and condemning it to endless doubt and conjecture.

We not unfrequently meet with remarks of a similar tendency to the following.† "It is of little consequence to seek the predisposing cause, when the atmospheric miasm, the occasional cause, was sufficient to infect the most healthy and robust, and even to make on them the greatest impression." Now, were no predisposition necessary, all exposed to an epidemic influence must experience its effects, and that continually, till the influence shall cease. That tensely strong and plethoric condition of the system, commonly called a "healthy and robust" one, is one in which it generally abounds in surplus matters; which, as will presently be explained, very materially constitutes the state of predisposition to the action of malaria. The foregoing quotation is, in the original, (a description of a malignant epidemic,) preceded by a statement that the season of the epidemic "was otherwise uncommonly salubrious." A circumstance not unfrequently noticed during the prevalence of malarious and other diseases; and one that as plainly directs us to the study of the predisposing, as of the exciting causes.

This skipping over the intermediate links of causation, and connecting together the two extremes of the chain, as the absolute cause and effect, is irrational, and an inevitable source of error and confusion. It naturally begets the idea that the origin of the disease is in a single cause; which, apart from direct poisons, and mechanical causes, it seldom or never is; a variety of causes conspiring to bring about the result. We need not look for improvement in this important branch of the art, until, in all our investigations into the matter, we shall be influenced by the axiom that it is the invariableness of antecedence alone, in a given phenomenon, that indicates the cause, and the invariableness of sequence the effect; and if in any instance, be it only once in a thousand times, this relation do not subsist, the occurrences cannot be correctly joined as cause and effect; but some

* Gregorie's Practice, by Colhoun & Potter.

† American Medical Recorder. Vol. 13. p: 55.

other condition or circumstance must be sought for. In seeking for causes and effects we should look for those things that are really and invariably connected; thus only can we redeem this branch of the science from the imputation to which it is now obnoxious, of being conjectural and vague.

Now if we consider malaria, and miasms generally, in accordance with this rule, we certainly cannot usually look upon them as single, or absolute causes of disease; for it is not the invariable consequence of exposure to their influences; very many persons being unaffected by them in times and places where they much abound; to say nothing of the inaptitude of animals to be affected by them. At the same time we cannot deny to them an efficient agency in the matter; for universal observation leaves no room to doubt that, under certain conditions, animal and vegetable malaria may become a source of fever, and other diseases; but it is only under these conditions that they do so. These conditions, then, the predisponents, are as much entitled to our attention as the excitants of the disease.

I will now proceed to enquire into the essential nature of malaria; how it excites its peculiar manifestations in the system; and in what way our remedies act in controlling them.

There has been much speculation concerning the matter of malaria. It has, at different times, been attributed to almost all the gases; carbonic acid; nitrous oxide, and other compounds of oxygen and azote; hydrogen; carburetted, phosphuretted, and sulphuretted hydrogen; &c. &c. have each been supposed to be the active principle; ideas, however, that have been abandoned; as the characteristic effects of malaria cannot be produced by these gases in the laboratory; neither can the existence of any of them be detected by the nicest analysis of the most concentrated malaria. It has also been referred to animalculæ floating in the atmosphere; a supposition purely gratuitous, as their existence has never been demonstrated; nor if it had, would it account for the phenomena of malaria. Of the nature of this noxious exhalation many of the most prominent writers upon the subject have expressed their ignorance. Dr. Maculloch remarks, "Perhaps the best and truest account of its nature would be an acknowledgment of utter ignorance!" A more grievous Hibernicism could hardly be conceived! Lat us hope that a better account than "an acknowledgment of utter ignorance," may be in time obtained of that, and many other things, at present more recondite.

Although, as far as my limited acquaintance with the writings of the great organic chemist, Liebig, extends, he has touched but briefly upon the subject of malaria, still his remarks upon it, and upon miasms and contagions generally, towards the conclusion of his "Agricultural Chemistry,"* appear to me so capable of elucidating the matter, that I shall take the liberty of making use of them in the construction of a theory upon the subject under consideration. I do this the more readily, as I observe, by several recent systematic works on medicine, that his views do not appear to receive the attention that I consider them entitled to.

It can be made apparent, I think, that the active principle of malaria, as well as of miasms generally, consists in a subtle, impalpable matter in the active state of decomposition, or oxidation, that floats in the atmosphere, and produces its effects on the corporeal system by extending the action of its own particles, or a similar one, among those atoms of the living system that are capable of consenting, and sustain the necessary contact; according to the axiom of La Place, "A molecule set in motion by any power can impart its own motion to another molecule with which it may be in contact." In this way an inconceivably minute portion of matter, in a certain state of decomposition, may disturb the combining forces in any amount of matter, the particles of which possess the requisite susceptibility, by communicating its own motions to it, from atom to atom, until the mass becomes affected, acting in the manner of a ferment.

It is a well known fact that certain substances, while undergoing decomposition, or oxidation, are capable of exciting a corresponding action in some other substances with which they may be brought in contact. Ferments of all kinds are probably nothing more than particles of an azotized substance, undergoing the process of oxidation, (or in an active state of decomposition,) and consequently possessing the faculty of exciting a corresponding action among the ultimate atoms of other substances that possess the requisite conditions.

The analogies in fermentative, putrefactive, and miasmatic actions are so numerous and striking, that we have strong grounds to suppose them similar in their natures. They are excited by, and consist in the decomposition of animal and vegetable matters; warmth, moisture, and exposure to the atmosphere, are in all equally neces-

* Philadelphia, 1843.

sary; a temperature of about blood heat being the most favorable; they are controlled by empyreumatics and antiseptics; chlorine and mineral acid fumes decompose miasms and putrefactive vapors, and when condensed, check fermentation and putrefaction in any substance; in short, in whatever way we look at these modes of action, we cannot fail to perceive resemblances, and find evidences that the action of malaria upon the system, bears strong analogies, at least, to fermentative or decomposing actions; indeed, I think it can be made tolerably clear that its influence on the living organism is nothing more than an extension or modification of the action that occasions the miasm, malaria, or contagion. In addition I may mention that it has been shown by M. M. Liebig, Julin, and others, that the moisture condensed on ice in a miasmatic atmosphere, and the dew gathered in the neighborhood of swamps, are capable of undergoing fermentation and putrefaction.

Though I speak of this theory of the fermentative origin of fever as being drawn from Liebig, still he is not to be considered as the originator of it; it is alluded to by several older writers; and, as with Crawford's theory of animal heat, Liebig is entitled only to the credit of its illustration and improvement. Good supposes that contagions act as ferments in the system, and Cullen remarks, "Those remote causes of fever, human and marsh effluvia, seem to be of a debilitating, or sedative quality. They arise from a putrescent matter. Their production is favored, and their power increased, by circumstances which favor putrefaction, and they often prove putrefactive ferments with respect to the animal fluids." As it would have conflicted with Cullen's favorite idea of spasm of the extreme vessels, as the universal proximate cause of fever, to have supposed that this tendency to putrefaction could act as such, he affirms that it does not, but that it is merely an accidental concomitant.

The doctrine that the proximate cause of fever consists in a tendency to putrefaction in the fluids is of high antiquity, and was maintained by the most prominent advocates of the humoral pathology. Hippocrates seems to have had some notion of the kind; Athenæus taught it more distinctly; and Galen went so far as to aver that a putrefactive disposition in different fluids excites different forms of fever, as that in the blood, it occasions continued fever; in the phlegm, a quotidian; in the yellow bile, a tertian; and in the black bile, a quartan ague; distinctions, however, that are apparently hypothetical.

These doctrines of the putrefactive origin of fever reposed pretty much undisturbed during the night science; but upon the dawn of learning again, and in its deceptive twilight, as it were, strange notions on the subject, as might be expected, were entertained; mysterious shapes that the object appeared to take in the uncertain and varying light. The chemical reactions of sulphur, nitre, mercury, acids, alkalis, &c.; the mechanical impediments of lentor, or viscidity, and the *error loci;* the vital actions of the dynamic power, the sentient principle, of capillary spasm, of sthenia and asthenia; and innumerable other vague imaginings, were, in turn, looked upon as the true cause of fever.

That the theory here offered will be found perfect, or that it will be exempt from the fate of its predecessors, I cannot venture to predict; but I think that it may assist in obtaining a correct knowledge of the matter, and that it is at least entitled to attention.

The following is probably the way in which malaria is formed, and acts upon the system. Under appropriate circumstances as to heat, moisture, exposure to air, &c., decaying animal and vegetable matters give off portions of their own substance, the atoms of which, not finally separated, are in commotion, constituting the active state of oxidation, or decomposition. These are capable of solution in the atmospheric moisture, or of diffusion through the air; and like ferments in general acquire activity from exposure to it. When a person is exposed to an atmosphere thus tainted, the decomposing particles become absorbed with the air, in respiration, and if the system be predisposed to be acted upon by them—that is, if the blood contain matter capable of taking on the requisite action—they communicate their own condition, a tendency to oxidation, to that matter, and a kind of decomposition or fermentation in it is the result.

I do not mean to say that it is a true putrefactive action that these particles excite in the blood; for the blood of patients laboring under contagions, or miasmatic diseases, may betray no peculiar tendency to putrefaction, when abstracted; but it is an action *sui generis* in each disease; and analagous to fermentation and putrefaction, as these are to each other. Neither do I mean to say that the whole matter of the blood becomes affected in these septic, or fermentative, diseases; but only certain particular constituents of it.

As different ferments may excite different kinds of fermentation in similar matters, so may different infecting agents excite different dis-

eases. These latter may be looked upon as different morbid ferments, producing different kinds of decomposition in the blood; some the variolous, some the rubeolous, some the ordinary continued febrile, some the intermittent, &c. Again, the morbid action may be modified by the condition of the matter acted on; in the same way that the same ferment may produce different kinds of fermentation in different fluids. Thus, the same morbid ferment may produce quotidian, tertian, or quartan intermittent. in one instance, and common continued, or typhoid, fever in another.

A peculiar condition of the corporeal fluids is usually necessary to the development of the morbid consequences of miasmata; it is not upon the regularly constituted organism or right condition of the blood that they beget disease; but, as a general rule, upon the system predisposed to their effects. If all the parts of the system are duly under the control of the vital forces, miasms, properly so called, and as we commonly meet them, are incapable of disturbing it; though from some accounts, it appears probable that the concentrated miasms of some mephitic districts of hot climates, may operate as a direct poison on man and animals; of these however I do not speak This predisposition to infection must be considered a casual condition; for it is not essential to a perfect state of the system; it can be, and very frequently is, prevented from being established; and when established, can be removed with positive advantage to the organism.

By the term miasm I do not mean irrespirable, or asphyxiating, vapors; these are direct poisons; but only those emanations from decomposing substances, that, as we meet with them, are sufficiently respirable, but are sometimes found to superinduce disease.

A susceptibility to the morbid impressions of miasms is apt to be engendered by superfluous, unwholesome, or badly assimilated aliment; imperfect chyle from bad digestion; a defective depuration of the blood by the proper emunctories; or any thing that may charge the system with crudities, superfluities, or matters having an unusual tendency to decomposition. Also, all things that weaken the vital forces, or unduly accelerate the decomposition of the tissues, as intemperance in drinking, exhausting labor, &c. tend to bring about a state of the system favorable to the morbid impressions of malaria, miasms, and contagions. In these conditions of the system a tendency to decomposition and oxidation in the blood commonly exists;

as is proved by fetor in the breath and feverishness; and we might *a priori* suppose that it would second the action of a suitable ferment.

I presume the reader to be acquainted with the way in which those materials in the blood that are prone to decompose, and *a fortiori*, those that have received the impulse of decomposition from a decomposing substance, are disposed to combine with oxygen, through the means of respiration, and engender animal heat. This I have already attempted to explain, and it is not necessary to repeat it.* The decomposing particles of the blood, the result of this *quasi* fermentative process in it, possess an eager affinity for the oxygen introduced by respiration; occasioning, in combining with it, an increase of heat, a deranged condition of the blood, and a general disturbance of the vital functions; in fact, the leading features of a febrile paroxysm.

An attack of fever I suppose to be commonly produced in this wise. The system is first predisposed to it by the blood being impregnated with matters less than ordinarily under the control of the vital influences; and therefore more obnoxious to the common chemical ones; this of itself may give rise to a degree of feverishness, or mild ephemera; but for a specific fever, something more is generally requisite; this may be furnished by particles of animal or vegetable matter in a state of decomposition, which are brought in contact with these matters in the blood, and in the manner of fermentation, excite among the molecules of these latter, motions similar to their own, characterized by an increased affinity for oxygen. Usually, at first, a torpor seizes the heart and lungs, as if they were desirous of obviating the heat, excitement, and disturbance that must necessarily be consequent upon the exposure to oxygen, of these matters ripe for combination with it; it is probable that the first changes in the blood, previous to the increased absorption of oxygen, make it less stimulating to the moving forces; and thus the chill, or congestive stage is formed, marked by a want of action, and external shrinking, and coldness, but internal engorgement. The spongy texture of the spleen, acting as a diverticulum to the morbid blood, thus prevented from passing on its round, becomes distended with it, and if the process be oft repeated, may become much enlarged. The heart usually soon arouses from its torpor; for the blood becomes stimulating, in propor-

* See Chap. III. on Animal Heat, &c.

tion as its oxidation progresses; and increased heat and arterial action take place; during which the chemical vie with the vital forces in acting on the blood; should the former prevail, beyond a certain point, death, with or without perceptible organic lesion, will ensue; if the latter acquire their due ascendancy the disease becomes subdued. All the emunctories are capable of aiding in throwing off the offending matters, and, by over-excitation, may become diseased. During this re-action, or fever proper, which is of uncertain duration, depending upon the condition of the system, and the nature of the exciting cause, the blood may, and mostly does, become purified by the combination of its effete matters with oxygen, and their expulsion in respiration, and by other secretions, visible or invisible, natural or artificial, and the system returns to a more healthy state; but as the excitement, and diseased condition of the blood produced by this decomposition, disorders all the functions to a greater or less extent, it may by greatly disturbing them, or their organs, destroy vitality before the healthy crisis can arrive.

The periodicity of the usual diseases of malaria may be owing to the decomposing substances in the blood being almost wholly consumed, or expelled, by the respiratory and secerning processes, during each paroxysm; when the fire, as it were, goes out for want of fuel. A spark—or leaven—however appears to remain, which acts upon the appropriate matters as soon as they shall have sufficiently re-accumulated; and thus the paroxysm is reproduced. It takes a length of time for this re-accumulation proportional to the ill condition of the system, and the activity of the excitement; if the condition of the system be getting more depraved, the paroxysms will anticipate; if it be improving, they will postpone. A continuance of this latter state will gradually extinguish the disease; this is the natural cure.

After a temporary interruption by the use of remedies, the interval being of several days, or even weeks, evincing, however, a partiality in the disease to septenary periods, these periodical diseases not unfrequently return; and it has been observed that after exposure to malaria, its effects are seldom observed before the seventh day; oftener on or about the fourteenth; and frequently about the twentieth. Thus showing that the matter of infection, original or resulting, is capable of remaining dormant, or brooding, if I may use the term, in the system for an indeterminate length of time.

These periodical diseases are commonly not contagious, either be-

cause the requisite matter of infection is not reproduced in the system, or it is decomposed before it is expelled. In contagious diseases the infectious matter is reproduced, and thrown off in an active state, and consequently capable of spreading the disease.

A ferment may excite transformations in only one of the components of a mixed liquid acted on by it; and its own reproduction may or may not result. If the ferment act upon a substance of its own kind, as yeast on gluten, it will be reproduced; if on a substance of another kind, as yeast on sugar, it will not be reproduced. This law may aid in explaining how some morbid effluvia may excite contagious, and others noncontagious diseases.

Agues, especially vernal ones, are frequently the means of cleaning up the system; of "purging it to a sound and pristine health." This admits of a ready explanation upon the foregoing principles; the dietetic habits necessary to enable the system to withstand the cold of winter, are apt, if continued when the weather becomes warmer, to superinduce a state of plethora, and load the body with superfluities. A mild ague, when malaria is neither rife nor active, and the body not debilitated or depraved by long exposure to sickening influences, becomes a safe and effectual means of removing these superfluities, and re-establishing the health upon a firmer basis.—Hence the old proverb.

"An ague in the spring, is physic for a king."

I do not contend for exclusive humoralism, or mean to say that the first morbid action in a fever is always in the blood; for deranged nutrition of a part, or perverted function of an organ, may be excited by the application of a deranging irritant to it, and the blood may become affected secondarily; the ground assumed is, that the proximate cause of fever (properly so called) is a depraved condition of the blood, of the kind stated,

I will now proceed to say a few words concerning the antidotes to malaria, &c. It is only over the periodical effects of vegetable malaria, or marsh miasm, that our remedies are capable of exercising a specific control. Taking the preceding theory of the cause and nature of these affections as true, it might, *a priori*, be supposed that the specific remedies must act either upon the miasm in the system, rendering it inoperative, or upon those parts of the system capable of responding to its action, rendering them insensible to its effects. I

suppose the remedial action to be mostly upon these latter; certainly not upon the nerves alone, as some would have us suppose.

The *modus operandi* (or mode of action) of medicines has always been a dark corner of medical science, and must continue to be so until the causes of disease are better understood. Until we can trace the *fons et origo*—the fountain and source of morbid actions, we cannot reasonably expect to understand very accurately the mode of their removal. "*Sublata causa, tollitur effectus*,"—the cause being removed, the effect is removed; though many who profess the healing art, satisfied with an empirical routine, trouble their heads but little about effects and causes.

The specific remedies for ague may be said rather to act as preventives than as cures. They do not appear capable of controlling the fit itself, when established; but their exhibition in the interval prevents the recurrence of the paroxysm. On this account they are incompetent to the cure of the continuous diseases resulting from decomposing miasms and contagions. In these cases, to arrest the further decomposition and elimination of decomposing particles, would be to lock them up in the system, to its probable detriment; but where the tendency to decomposition in the fluids is unusually great, (for instance, in what have been called putrid fevers,) a due exhibition of remedies that have the faculty of curbing decomposition may act beneficially by moderating that tendency and bringing it within the constitutional powers of endurance, till the depuration of the system shall be gradually achieved.

That a remedy may produce its peculiar or specific action directly on the system generally, it is necessary that it be soluble, and capable of being absorbed into the system undecomposed, or recombined in such a way as not to destroy its qualities. The antidotes to the known and ordinary effects of malaria are, as might be anticipated upon the previous views, those articles that, according to the above law, are capable of introduction into the system, and there restraining decomposition of the fluids. They are arsenical, and some other salts and oxides, some of the vegetable bitters and astringents, and, in short, those articles that are capable of exercising an antiseptic influence, in the system as well as out of it. These remedies may be said to take the case out of the hands of nature; for they check the natural actions growing out of the morbid causes, without expelling those causes. The adjuvants are those articles that tend to re-

move the crudities and superfluities, or the *fomes morborum*, from the system, as emetics, cathartics, diaphoretics, diuretics, and the antiphlogistics generally. These latter second the designs of nature by throwing off the morbid causes.

Among the palliatives of fever may perhaps also be placed some of those remedies that are supposed to have a refrigerant effect upon the system, as nitrate and chlorate of potash, and some of the acids. These probably operate by imparting oxygen to the blood, and thus lessening the consumption of it in respiration, and consequently diminishing the evolution of heat.

Antiseptics appear to act by controlling the affinity of substances for oxygen, as is evinced not only by their resistance of putrefaction, but, among other things, by the facts that arsenic, and the carbonaceous paints, as lamp and ivory black, retard the hardening of flaxseed oil, and charcoal prevents rancidity in fats, which hardening and rancidity depend upon oxidation.

The power of arsenic to restrain decomposition is well known. In fact, it is, even in very minute quantities, perhaps the most effectual antiseptic known. It is used to preserve subjects for dissection; a weak solution of it being injected into the vascular system. It is also used to preserve specimens of natural history. Indeed, its great powers in curbing decomposition constitute an objection to its use as a medicine, for, when applied to a living organism, even in minute quantities, it may prevent the necessary physiological transformations, and consequently destroy vitality. Bodies thus deprived of life, if the poison be retained in them, possess a remarkable exemption from decay. Malaria is not the only septic poison that arsenic is known to be capable of counteracting; it is a powerful antidote to the poison of venomous serpents—a poison that occasions rapid decomposition in the system, and is, perhaps, the most potent septic agent, or animal ferment, that is known. In India arsenic is much depended on for this effect, though I should presume more as a preventive of morbid action, before the poisonous action is fully developed, than as a restorative subsequently.

As has been said, however, arsenic is an objectionable remedy, because its action may extend beyond those particles, the decomposition of which it may be proper to restrain, and it may render those parts of the system subject to its action intractable to the vital powers; for we must recollect that, in these fermentative diseases, two sets of de-

composing forces are at work upon the system; the one pathological, and partaking more closely of the chemical laws of decomposition; the other physiological, and subservient to the necessary vital functions. To the restraint of the former only should the action of our remedies be directed.

Huxham, than whom a better authority on fever cannot be consulted, though near a century old, supposes the morbid effluvia that cause putrid fever to resemble, in their effects upon the blood, the poison of a viper. His favorite remedy in this form of disease was a tincture of bark, called after him Huxham's Tincture.

By those who suppose that all the direct remedies for ague must be tonics, arsenic is placed among that class; than which there could not be a greater error; it is a decided general debilitant; speedily producing a feeble and intermitting pulse; and any reaction that it may occasion is the result of local inflammation. To be sure any remedy may be called a tonic, in one sense of the term, that will have the effect of arresting morbid action, and consequently occasioning a restoration of the strength; and in this sense alone may arsenic be called tonic; its primary effect, however, is antiseptic.

We have a much safer and better remedy for the common effects of malaria, in the Peruvian Bark. This noble remedy ranks high as an antiseptic, or conservative; and is one that is well adapted to internal exhibition; as while it is usually sufficient, when timely administered, to check morbid decomposition, it is not powerful enough to interfere with the necessary vital changes. As a local application to putrid sores, and as a gargle for a sloughy and apthous condition of the mouth and throat, it is much used. With the mineral acids, and with chlorine, it is used to arrest the progress of those diseases that are attended with a depressed condition of the vital forces, and a tendency to decomposition in the fluids, as Typhus, Scarlatina, Purpura, &c. In fact, its conservative properties are those most distinctly recognized; and upon the preceding views, they are sufficient to account for its property of checking intermittent paludal fever. It has the additional recommendation of being a tonic, and in this respect has a great advantage over arsenic.

As has been remarked, intermittents are sometimes prone to return after the effects of the remedies have worn away; even without reason to suspect a repetition of the infection. This might induce us to suppose that the influence of the remedies has been confined to those

particles that are obnoxious to the impressions of the infecting agent; leaving the agent itself, or a reproduction of it, capable of future activity; and this we might, *a priori*, suppose; for antiseptics have less effect when decomposition has commenced; and are entirely incapable of re-instating matter once tainted. When the disease is thus disposed to recur, the most effectual preventive treatment is, in addition to the administration of antiperiodics, to remove crudities and superfluities from the blood, by means of evacuants and alteratives; as venæsection, cathartics, diaphoretics, &c. and then invigorate, and put the system in the best possible condition. *Piperine* appears to have some effect in preventing the return of an ague. It might be worth while to try the effects of a solution of *chlorine*, for the same purpose, administered after the interruption of the disease by the usual remedies, as a dis-infectant.

Not only are ill cured agues very liable to return, but in the autumnal season, and in sickly places, they are apt to be succeeded by more serious complaints; as dysentery, dropsy, and visceral engorgements. The consideration of these circumstances may serve to impress upon us the impropriety of an exclusive reliance upon antiperiodic remedies. Unless the system has been cleansed of its impurities, either by the action of the disease itself, or the remedies used, we may in vain expect a permanent cure. This tendency to relapse is favored by those causes that I have enumerated as predisposing to the disease.

The two remedies I have described, arsenic and bark, are the most effective ones we know of for controlling the periodic diseases excited by malaria; they are also the most effectual constitutional antiseptics that we are, at present, acquainted with; and viewing malarious diseases as of a septic character, we have every reason to believe that the power of their antidotes depends upon the possession of antiseptic virtues. It is unnecessary to go into a detail of other remedies; suffice it, that unless they act by evacuating morbid humors, they will all probably be found to have constitutional antiseptic properties in proportion to their real ability to cure the ague. In this latter case we may fairly place them in the same category with bark and arsenic; and refer that power to their antiseptic action. If other articles of the same class have not the faculty of curing intermittents, it is because they cannot comply with the before men-

tioned law of constitutional specifics; that they be capable of being absorbed into the system in such a way as to reta in their qualities.

Although it has become the fashion to decry theories, they are alike necessary and useful. The mind instinctively seeks an explanation of what is seen; and without one, all conduct concerning it is empirical and vague. As has been said by Darwin, "to theorize is to think; we cannot direct a cure without thinking, and happy is that patient whose physician possesses the best theory." The present one has the recommendation of harmoniousness; there is an agreement in all its parts, that we may look for in vain in any other on the subject that I am acquainted with, and which diffuses an air of probability, at least, through it. It makes the cause, the effect, and the remedy responsive in their natures; and is so far philosophical; at the same time it is consistent with the facts; and with slight modifications is capable of explaining the nature and mode of action of all feverous miasms and infections. I may be allowed, perhaps, to say thus much in its favor, as I do not claim the exclusive paternity of it.

APPENDIX No. 2.

ON CHOLERA, &C.

As the opinions advocated in this essay are very different from those generally current with regard to the causes of epidemic cholera, it may be expected that I should, upon that point, more especially attempt to fortify the positions I have taken. I therefore deem it proper to explain my views a little more fully with reference to that disease; and for this purpose shall append a few pages.

I shall briefly endeavor to explain the nature of what I consider may be the remote and proximate causes of that disease; in other words, how it may originate, and in what its essential nature consists. Should I be able to succeed in this, it would materially guide us to the proper plan of prevention and cure; upon both of which points there is at present so much discrepancy, that it can hardly be said that we have any guide or authority upon them—the conflict of authorities having pretty much the effect of neutralizing them.

The views advanced in this chapter may perhaps be esteemed somewhat hypothetical; I wish it to be understood, however, that I do not advance them positively, as ascertained and settled facts, but merely as speculations, deserving, perhaps, further investigation.

There has been a prevalent opinion, from very early times, that an effective external cause of epidemics exists in the atmosphere; although I believe it has never yet been demonstrated in what it consists. This opinion is, probably, to a certain extent, correct; I think there are evidences that the causes of epidemic cholera are partly atmospheric, and partly dietetic.

The nature of epidemic cholera has been but little understood. From the rapidity with which it sometimes passes to a fatal issue, it has been supposed to be a disease of innervation, and that the sensorial energy becomes exhausted suddenly in it, like the discharge of a Leyden jar.* This theory appears to me to be entirely gratuitous; the sensorial powers, in this disease, appear to suffer least, and remain in considerable perfection till the last; but the great circle of

* See Good's Study of Medicine—Vol. 1, Art. Cholera Spasmodica.

vital functions, performed by the liver, lungs, and kidneys, is deranged, or entirely subverted; and the blood, in the course of the disease, becomes unfitted for the purposes of nutrition and respiration. It is more than probable, then, that the disease originates in a lesion of nutrition and sanguification.

The different varieties of cholera, and of some other bowel complaints, as well as of many forms of fever, have in their causation much in common with each other. There are many reasons for supposing that a state of predisposition to these affections may be owing to an excess of carbon and hydrogen, or the fatty elements of bile, in the blood. This must of course depend upon an excessive use of matters abounding in carbon and hydrogen—as adipose matters, &c.—with the food. One of the first consequences of this state of things would be a demand upon the liver to separate and throw off these matters in the form of bile; which is a saponaceous compound, composed principally of fatty matters and soda. If all the materials for the formation of this be present in due proportions, and the liver be in a healthy condition, the secretion may be in proportion to the elements of bile present in the system, and adapted to that purpose; and a natural cure of the loaded state of the system may be effected by the way of a bilious diarrhœa or cholera morbus; or the oxygen supplied by respiration may lay hold of these superfluous matters, and engender fever; but if, in this condition of the system, any obstacle exist to the due elimination of bile, either from the absence of one or more of its necessary ingredients, (for instance soda,) or from a want of action of the liver, congestion of the liver, from its obstructed functions and circulation, and consequent engorgement of the blood vessels of the intestines, may ensue, attended with irritability of the bowels, and a transudation, or exhalation into them of the thinner and more transmissable particles of the blood, and the evacuation of these, untinged with bile, at either orifice of the alimentary canal. In this way a non bilious *cholera morbus*, *cholera infantum*, diarrhœa, or dysentery may be caused.

I would here beg the reader to bear in mind the nature of the portal circulation, the offices of the liver, and the relation of these things to the general circulation, and more particularly to that of the intestines; to remember, that if the portal circulation be impeded, the return of blood from the intestines is cut off, in proportion to the extent of the obstruction; and that an entire stoppage must occasion as

great an engorgement of the veins of the intestines, with exudation from, and irritation of their mucous surface, as if the veins that return the blood from the intestines had been tied.

The liver is the great organ for the separation of fatty matters from the blood, and is probably a check to the improper admission of such into the general circulation with the fluids absorbed by the veins from the intestines. It secretes these matters, combined with soda, in the form of bile. If the blood, from the lymphatic and lacteal absorption, contain more of such matters than is proper for its due constitution, or for the supply of animal heat, they must pass off with the carbonaceous secretions, especially the bile, or be consumed by a præternatural increase of the respiratory function, with augmentation of heat, &c.; or if the blood be not in some such way depurated, not only will the liver, from the nature of its office, be averse to the transmission of the impure fluid, and probably cause the visceral engorgements above referred to, but also an oily condition of the blood might be anticipated, from an accumulation of these matters in it. This condition of the blood, Dr. Macintosh tells us, has been found to exist in those who have died in the collapsed stage of epidemic cholera. This excess of carbonaceous matter in the blood is probably one cause of the fever that commonly ensues, in those cases that survive the collapse.

In the healthy condition, there is reason to believe that the soda of the bile is not excreted; but with the bile, absorbed from the intestines; and after the loss of the carbon and hydrogen of the bile by respiration, the same soda may go to form fresh bile with other carbonaceous matters, &c. But when fatty materials abound in the blood to a greater extent than can be appropriated to the use of the economy, or got rid of by other means, it becomes necessary that they should be poured out by the liver, and be excreted; and this will be apt to be effected as long as the formation of bile can take place; but this excretion occasions a waste of soda as well as fatty matters; and if the former do not exist in the system in sufficient quantity, which, from various reasons, is frequently the case, the secretion of bile must stop. The demand for soda is, perhaps, not so great in the system as that of the organic materials of bile, as, according to Liebig's views, the carbon and hydrogen of the bile is consumed in the process of calorification, leaving the soda at liberty, and capable of being reapplied to the purpose of rendering the fats

soluble and oxydizable; this being the fact, the supply of the alkali would not be needed in proportion to that of the other principles of bile, and consequently would not be provided by the system to the same extent. It would, therefore, be liable to be exhausted first, under that state of things that occasions a waste of both the organic and inorganic elements; and the soda being exhausted, the formation of bile must stop, with all the consequences thereupon dependent.

When the blood is loaded with the organic elements of bile, any thing that deprives the system of its soda will be apt to stop the secretion of bile, and produce the consequences heretofore detailed. It is from this cause, probably, that acid fruits and vegetables, and sour drinks, are so frequently followed by bowel complaints. The neutral salt, formed by the soda and the acid, may pass off by the bowels, skin, or kidneys; more probably by the first. That the free use of acid fruits occasions a loss of soda is evinced by the fact that, after living much upon them, there is generally, perhaps always, an increased desire for salt; for the soda of the bile is mostly drawn from the salt of our food.

Our Indian tribes have suffered much from cholera. They use a diet at all times composed largely of animal matter, with but little salt; to both which circumstances is their liability to this disease to be ascribed.

As well as the excessive use of fat as food, the use of spirituous liquors may have the effect of loading the blood, liver, and system generally, with adipose matter, besides deranging and torpifying the liver; and we have the strongest evidence that the addiction to intoxicating drinks is a great predisposing cause to epidemic cholera in all parts of the world. In India, Rammohun Fingee, a native physician of great celebrity, declares that "people who do not take spirits or opium, do not catch the disorder, even when they are with those who have it." "In the army under the command of the Marquis of Hastings, in India, consisting of eighteen thousand men, more than half died of cholera in twelve days. This dreadful mortality need excite little surprise, when the effect of free indulgence in intoxicating liquors, in a hot climate, is taken into consideration.*" And in every other part of the world, intemperance, as a qualification for the attacks of cholera, has been most plainly proclaimed.

* Grinrod on the nature, causes, effects, &c., of intemperance.

When the bowels are in a state of vascular engorgement and irritability, upon the verge of active and evident disease, a slight irritating cause may be sufficient to determine it; and a small quantity of vegetable, or other indigestible food, may start a train of violent morbid actions; but we should not give too much credit to such slight causes, but remember that the predisposition, effected by other and very different means, was already in existence. It is perfectly futile to aver that a diet of fruits and vegetables, in a climate or season adapted to it, can found a predisposition to cholera. Neither can theory nor observation bear out such an averment. In camps, cities, and crowded public institutions, where cholera has always most prevailed, a sufficient supply of sound fruits and vegetables is seldom to be procured; and in times of the prevalence of the epidemic, they have been almost wholly excluded; but inferior and refuse animal food is generally cheap, abundant, and easily obtainable; upon this the poor feed largely; and, with intemperance, it has been a most prolific source of the disease. Even where people are not straightened or controlled by circumstances, excesses in stimulating meats and drinks are frequently committed, and thus the door is opened to the epidemic, though, from a greater degree of caution, not so widely with this class of people as with the poorer and more reckless. Fat meats are commonly supposed to go further than lean, as articles of diet; they are therefore mostly selected by the poorer classes, the bulk of whose animal food frequently consists of the fattest bacon. The Germans are proverbially greasy feeders, and with us have suffered more than any other class from cholera.

But nothing has been as yet said that can account for the prevalence of cholera as an epidemic; for the causes enumerated are not like epidemics, occasional and periodic in their nature, but more or less continual. To account for epidemic cholera, then, something more is necessary. This is probably, at least in part, an atmospheric influence, and I think depends, to some extent, upon an acid vapor in the air; not that this is the only epidemic on atmosphere influence, but that it may be one. I do not mean to say that it can of itself occasion cholera; on the contrary, I deny that atmospheric impurities are the sole causes of any epidemic; but the predisposition existing, I suppose it to have, in a considerable degree, an effect in exciting the disease, though other causes, at present unknown, may be auxiliary. From the nature, as well as novelty, of the subject, our

opinions upon this atmospheric influence must as yet be somewhat speculative.

The occasional existence of a substance in the atmosphere, called ozone has been noticed of late years; and it has been supposed to be a cause of some epidemics, as influenza and cholera; between which diseases, it may be as well to remark that there are some striking points of analogy; they have observed nearly the same geographical route; both having their cradle in the east; the one affecting the mucous membrane of the air passages, the other that of the alimentary canal. Of the nature of ozone I have met with very slight accounts; to ascertain this, I instituted some experiments, (of which I gave a short account in a paper published here, Somerset, Ohio, July 26th, 1849.) These experiments led me to the conclusion that the substance called ozone is nothing more than the vapor of nitrous acid. It is said to have a nitrous odor, to be engendered by the action of electricity upon the atmosphere, to have considerable bleaching properties, and to be somewhat analagous to chlorine. A good test of its presence is said to be furnished by paper smeared with a mixture of iodide of potash and starch paste and exposed to the air. Its presence turning the paper at first yellowish, and then brown; if absent the paper remains colorless. In my observations I found the test paper to give the evidences of the presence of ozone; turning yellowish in a few hours, and quite brown in the course of a day or two; on being moistened with water, it turned purple for a few seconds; but if the water were rendered alkaline, all color was discharged. In the course of a month, or so, the color began to disappear in patches; when it was evident, from the paper sparkling on combustion, that the iodide of potash was to some extent converted into a nitrate. Exposed to the vapors of nitric and nitrous acids, and nitrous oxide, the test paper immediately underwent the same changes in color, with the same consequences upon the contact of moisture, or an alkali. A continuance of contact of the acid vapor soon destroyed all color. Upon igniting the test paper that had been acted upon, either by the acid or the atmosphere, it was retentive of the spark, in proportion to the extent of action effected on it. Thus the paper that had been colored and subsequently whitened by the action of the acid, scintillated, as if it had been impregnated with nitre; that which had been but slightly acted upon, was but feebly retentive of fire.

Paper washed with a solution of carbonate of potash, and hung up

in a room, I found, in the course of a month, to be considerably impregnated with nitrate of potash.

Old whitewash, scraped from the wall of a room, contained nitrate of lime, and treated with solution of potash, yielded nitrate of potash.

These observations were made during the months of June and July 1849, during the prevalence of epidemic cholera in other parts of the State; non-bilious cholera morbus, and other bowel complaints, prevailing in the vicinity of the place where the observations were made. The exciting causes, I suppose, were not of sufficient intensity to occasion epidemic cholera.

In the month of October following, during a time of unusual health, I exposed the test paper for several days, in my office, without its undergoing any change;—though when exposed to the vapor of nitric acid, it immediately turned yellowish, then brown; and finally lost all color, when it burnt and scintillated very vividly.

Upon these facts I came to the conclusion that during the former months, there existed a certain quantity of nitrous acid fumes in the air; and that the substance called ozone is, in reality, nothing else. The following I suppose to be the chemical changes that take place on the test becoming colored. The nitrous acid vapor at first combines with a part of the potash, forming nitrate and per-iodide of potash; to this latter the yellow or brown color is owing. If the acid be present in sufficient quantity, free iodine is disengaged faster than it evaporates, which strikes a purple color with the starch; moisture appears to facilitate the production of this purple color; and the disappearance of the tinge is, owing to the evaporation of the iodine. The removal of the brown color by an alkali, I suppose is due to the combination of the acid with the alkali, reducing the per-iodide again to an iodide.

Notwithstanding the fact has been but little noticed, still, upon a consideration of the matter, we might, from reasons both of an *a priori.* and *a posteriori* nature, anticipate the existence of this acid in the atmosphere. Nitric acid is well known to be generated by the electric spark acting on the atmospheric air—oxygen and nitrogen being thus united in the requisite proportions. Also ammonia is said to be liable to oxidation, under favorable circumstances, its nitrogen becoming nitric acid, and its hydrogen water; now ammonia always exists in the air; nitric acid must therefore, *a priori* be presumed to be produced by lightning, and other electric action; as probably by various

other causes. And to account for the fact that the potash of the soil, and indeed all alkaline substances, when exposed to the air in sheltered situations, being converted into nitrates, the simplest and most obvious reason is, their combination with the nitrous acid of the atmosphere.

The older theories of nitrification, or the formation of nitre by atmospheric agency, are objectionable as being complex, when a simpler and more satisfactory explanation is at hand. When we observe that every alkaline substance, whether volatile or fixed, is liable by exposure to the air, at times, to be converted into a nitrate, how much more easy and obvious is the supposition that the necessary acid exists already in the air.

It seems necessary to the preservation of atmospheric purity that a certain quantity of the acid vapor should be formed in it; and that where animal and vegetable decomposition goes forward the most rapidly, there should be engendered the most acid; for this decomposition supplies ammonia in quantities that might, under some circumstances, render the air exceedingly impure, or even irrespirable, were there not some provision for the neutralization of the alkaline fumes. There appears to me to be a precise and beautiful adaptation and arrangement to subserve this purpose; for we find active electricity, and the evidences of the acid vapor in the air, to exist in the greatest abundance in those times and regions when and where animal and vegetable putrefaction is the most active. There also the nitrates form the most abundantly, by which means, with rain, &c. the air is purified from the acid. Is it not owing to this state of things that thunder storms have acquired the reputation of clearing up the air? a reputation that they probably deserve.

It appears that in times and places at, and in which, the cholera prevails, this acid vapor exists in greater abundance; and it is probable that its existence in the atmosphere is intimately associated with the prevalence of the epidemic. This will explain at once how it is that lime, scattered freely over the ground, should exercise such a marked preventive action as it is said to have done, in some instances.

It is probable that various local causes may have the effect of favoring the combination of oxygen and nitrogen in the atmosphere. It is said that the presence of ammonia, in connection with organic decomposition, has that effect. Warmth and moisture are highly condu-

cive and even necessary to it. Thus we might expect that a warm, damp, and impure air would favor the spread of the disease; and such is notoriously the fact.

In India where decomposition is very active, and nitrification by atmospheric agency equally so, and where we may consequently presume nitrous acid vapor to exist most abundantly in the air, the epidemic cholera had its origin, and continues most prevalent and fatal; other bowel complaints, as dysenteries are likewise so.

There are probably other causes, not at present understood, the combination of which is necessary to the development of the epidemic. It is doubtless the occasional coincidence of all the necessary causes that brings about the occasional prevalence of an epidemic; one of the most obvious and effective of these causes of cholera I suppose to be the existence of this acid vapor in the air; and where its presence does not occasion the disease, it is because the necessary combination of other causes does not exist.

The *quo modo* of the excitation of the disease by this atmospheric influence remains to be explained; and this I think can be done in a very few words. The acid is absorbed with the oxygen in respiration, and combines with the soda in the blood, whence the soda becomes expelled as a nitrate, in the urine, sweat, or by other channels; thus depriving the system of a portion of its necessary soda, and preparing the way, should an excess of carbonaceous matter exist in the blood, for those consequences that we have already described as depending upon an excess of the organic elements of bile in the blood, and which the liver is unable to secrete for want of the proper inorganic parts.

A variety of circumstances conspire, in warm climates and weather, to deprive the system of its soda, otherwise than by the excretion of bile. Upon the supposition of a precise adaptation in all the plans and operations of nature, a supposition, I take it, that cannot be gainsaid, this fact would go to prove that bile is, under a warm temperature, less needed in the system; and that consequently fats, vinous fluids, and bile-making food generally, should then be less used. Sweating is one of the means by which the salts of soda are lost to the system; in may consequently operate as a check to the secretion of bile. From a deficiency of saline ingredients in the system, the copious sweat of cholera patients is but slightly salt, and the blood is found to be in the same condition.

A reason why the needful muriate of soda is less apt to be lost to the system through those emunctories that transmit the neutral salts, as the skin, kidneys, &c., than is the nitrate, is because the glands of the stomach secrete free muriatic acid, on which, with the addition of *pepsine*, the solvent power of the gastric juice is supposed principally to depend; this muriatic acid is derived from the salt of the food, the soda going to the bile.

The coldness and blueness attendant upon cholera plainly indicate an obstruction to the circulation, and congestion, existing in some central part; and other facts and circumstances show that this obstruction and congestion exist in the liver and the portal system. Frequently before death this obstruction yields, the blueness disappears, and warmth returns; this is the reason why we may sometimes see no evidences of hepatic congestion on a *post mortem* inspection of the body; though evidences of the existence of such congestion are most commonly to be found after death by *cholera*, *cholera infantum*, and other kindred diseases. This congestion is said by Dr. J. M. Good, and others, to have been uniformly found in those who died of the disease in India.

The cramps of cholera are probably partly dependent upon the condition of the blood, and partly upon intestinal irritation. They are usually attendant, though commonly less severe, on the latter affection alone.

I have now perhaps said enough to make it probable that epidemic cholera is more dependent upon the too free use of food composed of the heat-making elements, or the organic materials of bile, than is generally supposed, and that the state of predisposition to that disease does not depend upon the use of fruits and vegetable food, though, when excess of animal food is used, especially the fats, fruits and vegetables may be incompatible, and excitants of the disease.

Preventive and remedial management should be built upon a knowledge of the essential nature of the disease; without this it will be apt to be unstable and vague. The nature of a disease being understood, the appropriate treatment becomes pretty obvious, though success in it is not always in our power. Presuming the foregoing opinions to be founded on truth, the prevention of cholera, and the diseases akin thereto, would evidently consist in the first place in the avoidance of all undue use of the organic materials of bile; especially fat, animal, and spirituous ingestæ. A proper conformity to this

rule would go far to insure an immunity from the disease, and do away with all risk of ill consequences from any reasonable use of fruits and vegetables, without which perfect health in warm weather is unattainable. Should this leading rule, however, be violated, and food of the proscribed character be made use of, the next most material means of safety would be offered by the use of a sufficiency of soda to supply all waste of that material, and for the conversion of the excess of carbonaceous matters into bile; and by the avoidance of the undue use of acid fruits, and indigestible vegetables, and in fact of all other acid or irritating matters. Should irritability of the bowels supervene, bulky food, and that which may be difficult of digestion, should be avoided; and an unstimulating, light, and abstemious diet be observed.

I can answer, from my own experience and observation, that the plan above recommended is safe and effectual; having seen a good deal of the disease in 1832, when I was a physician to the dispensary at Brooklyn, N. Y.; and some little subsequently; and never did I know it to attack any who came at all near conformity to the rules I have here laid down; though every day experience during the epidemics proved the fallacy of the prevailing rules; and the more opposite to the doctrines of this essay were the habits, the greater, in general, was the liability to the disease. I most emphatically affirm, that under my observation, it was not a deficiency of animal food that ever occasioned the disease; on the contrary, I never knew a person to suffer from that scourge, who was not addicted to the use of fats, animal food, or spirituous drinks, to an extent unnecessary and improper for the climate and weather.

On the view of the disease here taken, may satisfactorily be explained the reason of its frequent intractability. In severe cases, when, owing to the absence of the proper and necessary materials for the formation of bile, or from organic disease, the liver is unable to perform its office; when the portal circulation, and all absorption from the alimentary canal are utterly stopped, and the corporeal powers are prostrated by the profuse discharges; we need scarcely expect to derive much permanent benefit from the exhibition of remedies by the mouth. The exhaustion and collapse attendant on the disease may be the means of relieving the congestion, and re-establishing absorption, when occasionally, and under some circumstances, a recovery may ensue. These cases, however, may frequently rather

be said to get well than be cured. In these desperate cases, the injection of proper saline solutions into the veins, (as of the carbonate and muriate of soda,) has sometimes succeeded in snatching the patient, as it were, from the very jaws of death; and it is, probably, at these times, the only treatment that we know of, though one full of hazard, that can be said to be capable of exercising a positively curative influence. In milder cases, where absorption from the alimentary surface still to some extent takes place, the exhibition by the mouth of the saline solution, copiously, is said to have been attended with a happy effect; and has been, by some physicians, much relied on. It has, however, given rise to a sorry jest, that "however it may be with pigs and herrings, salting the patient is not always the same as curing him." But I shall not discuss the treatment of this epidemic, as it is not my object to furnish directions for the treatment of diseases, but dietetic rules for their avoidance. There is another remark, however, that I will make, regarding the premonitory diarrhœa mostly attendant on the disease. These discharges are frequently established for the removal of something noxious, and are generally indicative of a deranged condition of the system. Their proper treatment, whether by evacuants or astringents, frequently calls for a nice discrimination, and should depend upon the condition of the system; but it should be borne in mind that a diarrhœa is particularly dangerous during the prevalence of the epidemic, from its being very liable to be followed by a stoppage of the hepatic secretion, with all the phenomena of the confirmed disease; it should therefore be watched with great anxiety, and checked as soon as the condition of the system will admit of it. It is at all times, however, of the greatest importance to adopt right dietetic rules. How many have there not been cut off by cholera, from stopping discharges adapted to the relief of the system, and at the same time continuing to pursue the habits that have led to its derangement.

Safety from this, and all other diseases, is only to be attained by the pursuit of correct habits of life; and it is my earnest hope that the study of these few pages may assist the reader in determining what those habits should be.

Affinity. The attraction that different substances have for each other in chemical combinations.

A fortiore. By a stronger inference.

Albumenuria. A disease of the kidneys, characterized by albuminous, or coagulable matter in the urine.

Ammonia. A pungent alkaline vapor, composed of hydrogen and nitrogen.

Antiphlogistic. That which will allay inflammation.

Antiseptic, Having the power of preserving from decomposition.

A posteriori. An argument by which a fact is inferred from something that has succeeded it.

A priori. An argument in which the conclusion is drawn from a pre-existing fact.

Apthous. Resembling aptha—the disease commonly called the thrush.

Areolar tissue. The loose substance connecting the skin to the parts beneath, &c. mostly containing fat.

Asthenia. Debility.

Azotized. Containing nitrogen combined chemically.

Cæteris paribus. Other things being equal.

Caffeine. An azotized principle in coffee.

Calorification. The function of generating animal heat.

Capillary. Hair like. The minute branches of the blood vessels are so called.

Carbon. An elementary substance, the principle of charcoal.

Carbonaceous. Containing carbon.

Carbonic acid. A gas composed of carbon and oxygen. Choke damp.

Carburetted hydrogen. An inflammable gas composed of carbon and hydrogen. Fire damp.

Cardiac. Relating to the heart.

Carnivoræ. Beasts of prey; those species that are adapted to feed on flesh.

Cereal gramina. The grasses that produce the bread grains; as wheat, rye, maize, rice, &c.

Chlorate. An alkaline, or other base, combined with chloric acid.

Chlorine. An elementary gas, possessing disinfecting and antiseptic properties.

Cholera infantum. A vomiting and purging in infants; sometimes called the summer complaint.

Cholera morbus. A disease characterized by vomiting and purging.

Chyle. The milky nutritious fluid that is absorbed by the lacteals from the intestines.

Chyme. The pulpy mass that the food is reduced to in the stomach.

Cæcal. Relating to the cœcum.

Cœcum. The first of the large intestines.

Colon. The second and largest portion of the large intestines.

Congestion. A preternatural accumulation of any of the animal fluids in their proper vessels; generally of the blood.

Cretinism. A disease endemic in some mountainous regions, somewhat like the rickets.

Decarbonated. Deprived of carbonic acid.

Dermal. Relating to the skin.

Diverticulum. A by way. It sometimes means a temporary receptacle of any of the corporeal fluids, for the relief of another organ.

Duodenal. Relating to the duodenum, that portion of the small intestines next to the stomach.

Dynamic. Relating to force; especially the vital power.

Embonpoint. Plumpness.

Endosmose. The passage of liquids or gases through membranes from without inwards.

Error loci. Error of place; an old pathological term, signifying red blood forced into vessels unadapted to its transmission, and there impeded.

Erythematic. Affected with a superficial inflammation or diffused redness.

Exosmose. The passage of liquids or gases through membranes from within outwards.

Ex cathedra. Proceeding from an authoritative source; dogmatically.

Fœtal. Appertaining to the fetus or embryo.

Fomes morborum. The fuel of diseases.

Gastrodynia. A painful affection of the stomach.
Goitre. A tumor in front of the neck; an enlarged thyroid gland.

Herbivoræ. Those animals that feed on herbage.
Humoral pathology. Humoralism. Doctrines that attribute diseases to a wrong condition of the fluids.
Hydrogen. Inflammable gas; one of the elements of water.
Hypogastric arteries. Arteries of the lower belly, that, in the fetus, go to form the navel chord. The internal iliaes.

Ingestæ. Things that are taken into the stomach.
Innervation. The process of supplying with nervous energy.
Iodine. An elementary solid.
Iodide. A compound of iodine.
Isomeric. Bodies having an identity of elementary structure, though differing in appearance, are so called.

Lacteal absorption. The imbibition of chyle from the intestines by the appropriate vessels called lacteals.
Lesion. An injury or derangement of a part.
Leyden jar. A glass vessel for containing electric fluid.
Lymphatic absorption. The imbibition of the old or superfluous matters from the animal system by the appropriate vessels called lymphatics.

Malaria. The infecting vapor from marshes.
Mammalia. Animals that suckle their young.
Materia alimentaria. Those things that are used for food.
Miasma, (pl. *miasmata*). An atmospheric impurity tending to the production of disease.
Molecule. An atom. The least possible division of a body.
Mucous membrane. The moist surface that lines all the cavities of the body that open externally.

Nitrate. An alkaline or metallic base combined with nitric acid.
Nitric acid. Aqua fortis. A corrosive liquid compound of four atoms of oxygen and one of nitrogen, with water.

Nitric oxide. A suffocating gaseous compound, of two atoms of oxygen and one of nitrogen.

Nitrogen: Azote,—an inert gas; a principal constituent of the atmosphere and most animal matters.

Nitrous acid. Similar to nitric acid, but having only three atoms of oxygen to one of nitrogen.

Nitrous oxide. An exhilarating gas, composed of one atom each, of oxygen and nitrogen.

Normal. Regular.

Orchis. A tribe of plants, some of which have roots slightly nutritious.

Organic disease. One resulting in an evident change of structure.

Oxidation. The process of combining with oxygen.

Oxide. A compound of oxygen with another body.

Oxygen. Vital air; a constituent of the atmosphere; the great promoter of life, combustion and decay, and the most widely diffused and active element in nature.

Oxygenated. Mixed with oxygen.

Pabulum. Food. Aliment.

Paludal. Relating to marshes.

Pepsine. An active principle of the gastric juice; an assistant in digestion.

Per. In chemistry, a prefix denoting excess.

Periodicity. A disposition to return at stated times.

Phosphuretted. Combined with phosphorous.

Placenta. The afterbirth. The medium of connexion between the mother and the fetus.

Pneumo-gastric (nerves.) The eighth pair of nerves, passing from the brain to the chest and abdomen, and the agents of digestive excitation.

Portal circulation. That from the veins of the intestines through the liver.

Post Mortem. After death.

Prolapse. A protrusion or falling down of an internal part.

Proteine. The basis of animal nutrition, and substance from which the tissues are mostly derived.

Proximate cause. The disordered action in which a disease consists.

Pultaceous. Of the consistence of mush or porridge.
Pyrosis. The water brash; a painful affection of the stomach, attended with a vomiting of watery fluid.
Purpura. A disease marked by the extravasation of blood in spots beneath the skin, and elsewhere.
Pyrexiæ. Febrile diseases.

Quasi. As though.
Quartan. Occurring every fourth day.
Quo modo. By what method.
Quotidian. Occurring daily.

Rubeolous. Of the nature of measles.

Sacculi. Small cavities or cells.
Sporadic. Diseases not dependent on a general cause.
Sthenia. Strength. Excess of vital action.
Sui generis. Of its own kind.
Sulphuretted hydrogen. A gas composed of hydrogen and sulphur.

Tertian. Occurring every other day.
Tetanus. A disease marked by spasm and muscular rigidity.
Theine. An azotized principle in tea; the same as caffeine.
Theobromine. An azotized principle in chocolate.
Thyroid gland. A two lobed gland in front of the neck.
Tissue. In anatomy, the texture of the different organs.
Typhus. A fever marked by depression of the vital powers.

Urea. The characteristic constituent of urine.

Variolous. Of the nature of small-pox.
Venæsection. Bleeding by cutting a vein.
Viscera. (Singular, *viscus.*) The internal organs of the body.

TABLE OF CONTENTS.

ERRATA.

The reader will please correct the following errata, which were overlooked in the correction of the proof. A few, having been discovered when the edition was partly worked off, and corrected in the remainder of it, may have found their way into the present copy; for them, and for any that may have remained undetected, the reader's indulgence is asked.

Page 3, line 3 from top, for "or from," read or whether from
" 9, " 11 " bottom, for "confirmation" read conformation
" 17, " 9 " top, omit "to"
" 20, top line, for "Digestion." read digestion,
" 21, line 7 from top, place the parenthesis before "the"
" 24, " 6 " bottom, for "as" read at
" 29, " 3 " top, for "eboe" read Eboe
" " " 10 " bottom, omit "of"
" 33, " 16 " " for "dietitic" read dietetic
" 39, top line, for "fiy" read fly
" 40, line 15 from top, for "resource" read reconrse
" " " 4 " bottom. after "flesh" put a comma
" 47, " 11 " " omit "being"
" 48, " 10 " top, for "or" read of
" 50, " 15 " " for "theis" read these
" 60, " 9 " " for "exhiliration" read exhilaration
" 76, " 4 " bottom, for "fewest" read smallest
" 79, " 4 " top, omit c in "neccessarily"
" " " 19 " " " " "neccessary"
" 80, " 14 " top, for "strong" read strung
" 81, " 3 " bottom, for "Lat" read Let
" 87, " 14 " " for "excitement" read excitant